Engineering News-Record

Devoted to Civil Engineering and Contracting
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September 26, 1918

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Volume 81 September 26, 1918 Number 13

Engineering News-Record

A CONSOLIDATION OF ENGINEERING NEWS AND ENGINEERING RECORD, WITH WHICH IS INCORPORATED THE CONTRACTOR.

E. J. MEHREN, *Editor*

CHARLES WHITING BAKER, *Consulting Editor*

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

E. J. MEHREN, *Editor* — CHARLES WHITING BAKER, *Consulting Editor*

Volume 81 — NEW YORK, THURSDAY, SEPTEMBER 26, 1918 — Number 13

Save Paper!

EVERY one can do a little, many can do much, all together can do a great deal in answer to the appeal of the War Industries Board to save paper. Three pounds of coal are released for every pound of paper conserved. What can *you* do to save paper?

Penalties for Impure Water Supplied on Lake Steamer

WARNING to owners of lake steamers that if they supply polluted water to passengers it will be at the risk of heavy money penalties for typhoid is afforded by the decision of the Federal District Court at Detroit, noted on p. 581. The fault was one which could not be overcome by the supervision of railway and steamship water-supplies exercised by the United States Public Health Service unless the service were to place an inspector on each train and boat to guard against the taking on of any polluted water in case the certified supply fails.

Joint Use of Special Railroad Equipment

ANNOUNCEMENT has been made by the Southern regional director of the Railroad Administration that the all-steel dynamometer car owned by the Nashville, Chattanooga & St. Louis Ry. has served its purpose on that road and is now available for use on any of the railroads under Federal control. This illustrates one of the incidental opportunities of unified operation. There is much in the way of test cars and other special equipment that, while it must be provided on certain occasions, is not in anything like constant demand. There has been some lending around of this equipment in the past, but also much duplication. Such lending around and the elimination of unnecessary duplication become the natural thing under Government operation.

Municipal Strikes and Automatic Wage Changes

MUNICIPAL strikes have not yet become numerous, but they show which way the wind blows. The general cause is a demand for higher wages to meet the increased cost of living. This was the case recently at Albany, N. Y., when about 40 water-works employees, including laborers, calkers and meter inspectors, went out. The Board of Estimate promptly raised wages and the men resumed work. This and other incidents, notably the recent strike of 20,000 London policemen, suggest some more rational and less disturbing plan of insuring wage readjustment. The cost of living as a wage basis has been put into effect for certain employees of Cuyahoga County, Ohio, as described in *Engineering News-Record*, Aug. 1, 1918, p. 238. Industrial employers may also note with possible profit the example set by a private company at Cleveland, mentioned in *Engineering News-Record*, Sept. 5, p. 432. Automatic wage readjustments resting on a scientific basis deserve widespread attention on the part of public and private employers, laborers and all who have the general welfare at heart. In war time nothing which can reasonably be done to avert strikes should be left undone.

More Ships!

SHIPBUILDING progresses rapidly, but the need is greater than the speed. This is apparent from the official shipping figures printed on p. 598 and from our program to send 250,000 men overseas every month for nine months to come so as to increase the 1,750,000 already sent to 4,000,000 by June 30, 1919. Food Administrator Hoover has just announced that the military program calls for a movement of 17,550,000 tons of foodstuffs and feed grains during the year, or 5,730,000 tons more than during the year 1917-18, which excess is 197,000 tons above the average yearly total shipments in the three years before the war. This takes no account of munitions and other materials which bulk large. If we can move the men and supplies to fill this program and thus end the war in 1919 instead of 1920, a million American lives may be saved. That is why we must have more ships and one of the reasons why on every hand industries not essential to the war must be shut down. Steel, coal, other materials and labor must be devoted to shipbuilding and to other war industries.

Let the Good Work Continue

THE justice of highway contractors' claims for increased compensation is being recognized by the public. While officials, in the fulfillment of their constitutional duties, have found it necessary to order that work be done as if times were normal, and while it has too often been the custom to brand the contractor as a grafter, it is refreshing to see the public, which after all is the final court, step forward and make up the losses which would otherwise be suffered. An instance of such action is set forth on page 588 of this issue, where the farmers of Vermilion County, Ill., donated teams and money to finish roads which were shut down on account of the bankrupting war conditions.

As has been pointed out before by this journal, relief of the contractor in these abnormal times is the only just and logical course for a community to pursue which does not wish to be put in the position of "getting something for nothing." Let the good work continue; it is in harmony with that new day of coöperation which appears on the after-war horizon.

Personality

CHARLES SCHWAB has in full measure the technical qualities required of the head of our great shipbuilding program. On the solid foundation laid down by his predecessors, he has utilized his knowledge of the steel business, his marvelous organizing faculty and, not the least, the confidence he has inspired in his fellow citizens to build a machine which functions better every day. But with all these his greatest success has been with the workmen themselves. Almost daily he appears at some shipyard for a talk with the men. Not then is he the millionaire organizer and executive; he is Charley Schwab, steelworker. Man to man he meets them. Workman to workman he talks to them. From rivet heater to works manager they feel that here is one of the boys, one of the thousands who by brawn and skill are building Pershing's bridge of boats. If ever a man has not "lost the common touch" in growing rich, it is Schwab. And this is success beyond millions of dollars.

Efficiency of Government Operation of the Railroads

PUBLIC answer to a newspaper criticism of Government operation of the railroads, as shown by comparative statistics for the first five months of 1918 and 1917, is made on behalf of the Railroad Administration by Theodore H. Price, actuary to the administration. He points out that while the ton mileage decreased only slightly (0.6%) in 1918, the loaded-freight-car mileage decreased 8.6%. The difference in percentages he attributes to better loading of cars, and the running of longer trains. The newspaper had condemned the administration for having failed, with all its money available, to add materially to the number of locomotives and cars. Mr. Price states that the 4,000 locomotives and 100,000 cars that have been under order a long time could not be turned out in a day, but holds that it is evidence of efficiency that more complete loading is being got out of existing equipment. He shows that this better loading has produced the equivalent of 211,200 freight cars and 1750 locomotives.

As to the slight decrease in ton mileage in the face of what is supposed to be the greatest demand for transportation that ever existed, he attributes it to reduction in the necessary mileage through better routing. In several cases, he states, the distance that freight in transit between two important cities formerly traveled has been shortened from 200 to 500 miles, and one instance is cited where 8999 cars were so rerouted as to effect a saving of 195 miles per car, which at 6c. per car-mile means $105,278. More data of this sort would be extremely interesting. A somewhat better idea of the total saving effected by better routing could be had if the table on which the discussion is based showed, as it does not, the total of tons moved; and a still better index to how much more useful transportation was provided in 1918 than in 1917 would be available if each shipment could be translated into ton mileage on the basis of straight-line distance between shipper and consignee.

In support of his argument that Government operation has proved more efficient than private, the use of two figures is more surprising than convincing. These are the average car mileages per day in 1917 and 1918. While the former figure was 26.4, the latter fell to 23.7. Mr. Price holds that this falling off is directly due to the heavier car load and train load, necessitating slower running of trains, and is therefore another indication of efficiency. This would hold if the 26.4 and 23.7 represented anything like the number of miles per day a car should run while in a train on the road. They do not; they represent what the car should make in only two or three hours of the 24-hour day. On that basis the average lost mileage per car per day, due to standing time for loading and unloading, time in the shops for repairs, switching delays at yards and terminals, etc., is something like 200 miles. To reduce this lost time the Railroad Administration is able to impose far more drastic penalties than the private owners were for failure to load and unload cars promptly; to pay considerably more for shop labor and send bad-order equipment to shops best able to handle it; to route shipments with a view not only to minimum mileage but to avoidance of congested lines and yards. Apparently it would not have been a great feat under the circumstances to take up the 2.7 miles per day attributed to the slowing down of trains, and an additional 5, 10 or 25 miles.

In the main, however, Mr. Price's argument is convincing. Surely there is no warrant for broadcast condemnation of Government operation on the basis of the figures to date. *Engineering News-Record*, while believing that the private managers did as well last year as was possible under circumstances not under their control, sees no reason yet to withhold commendation of Government operation as a war measure.

A New Engineering Education

REORGANIZATION of engineering courses along the lines dictated by the needs of the practicing engineer is strongly advocated by Prof. F. H. Bass on p. 582. There will be full sympathy with his point of view on the part of practitioners. But more than sympathy is needed. There must be action, the exercise of influence upon those who design and direct engineering courses. Obviously, the engineering societies are in the best position to crystallize the views of the profession and present them to the college. For years they failed signally to perform that obvious duty. Not until Dr. Mann undertook a survey was anything worth while done. His report, certain to be of great value, is anxiously awaited.

Educational reorganization is one of the problems of reconstruction. At this minute the standards of the past have been rudely cast aside. This year there are no regular engineering courses. The army dominates everything—and it will continue to dominate the colleges as long as the war continues. When peace

comes we can start with a clean slate. May the new writing better serve the end than the past. Professor Bass is thinking straight; so also we are sure is Dr. Mann. On their ideas can be built a new engineering education fitted to the larger conception of engineering which recent years have been developing and which the war has accelerated.

What British Labor Wants

LAST winter a subcommittee of the British Labor Party prepared a reconstruction report making drastic demands. It was drafted, we were told in the United States, by the high-brows, the Fabians, with Sidney Webb at their head. Predictions were that the rank and file would repudiate the radical recommendations. The event has proved otherwise.

In June the labor party held a general conference. The sub-committee's recommendations were adopted practically in full. One expected that labor would demand a minimum wage, restoration of trade union conditions, unemployment insurance and similar measures contemplating the restoration of the status quo ante or in line with the tendencies of British labor's demands in the years before the war. But the resolutions adopted go further. They demand the retention in public hands of the railways and canals, public control of super-power stations for the generation of electricity, nationalization of the coal and iron mines, and government control of capitalistic industry, organizing, controlling and auditing processes, profits and prices. In a word, they demand that the socialization brought about by the war shall be made permanent. They argue that what is good for the nation—for its citizens—in war is good in peace. But not satisfied with this socialization, they ask for the "equitable" conscription of accumulated wealth, exempting fortunes below $5000, the basis for the demand being that income taxes alone will not be great enough to discharge in a reasonable time the enormous war debt. In this connection they decry taxes on food and other necessities of life.

Can we draw from this British experience any conclusions of value to ourselves? Obviously, the conditions are different; the labor movement here has not developed in the same way England's has. But we have socialized our industrial systems, too. Much of the coöperative result is good and should be retained. Shall we, in trying to keep the good, let unwise counsel prevail and handicap initiative? The answer is with the future.

As to accumulated wealth, is the attitude of our Congress much different from that of British labor? We fear that it is not. There is in Washington a distinct lack of sympathy with the industrialism that has builded this nation. And that lack of sympathy does not stop with mere—and proper—protest against the abuses of the system. It extends so far even as to deprecate the initiative that is the root of all our pioneering, whether in the subjugation of our West or in launching new industrial enterprises.

Unfortunately, we are not preparing for the troublous times that must decide these issues. This journal has urged the formation of a great reconstruction commission. If the President does not act we may go into peace as poorly prepared for it as we were for war.

Safety Engineering Demanded in the Construction Industry

SAFETY engineering, by the enthusiasm of its followers, by its clear purpose and by its material accomplishments, commands a distinguished place among the specialties of the professional engineer. Last week several hundred of these men met in convention at St. Louis to present and discuss the problems of their work. A full week of meetings was required to dispose of the program. At periods half a dozen sections were holding sessions simultaneously. There was work done at every session, practical accomplishment in forwarding the methods and practice of preventing industrial accidents.

Realization of the toll which accidents are taking steadily from our workmen has come slowly to the people. Even the factory manager has been tardy in grasping its immensity. The civil engineering constructor, broadly speaking, has not given it even cursory attention. How many construction men realize that death or injury by accident removes from our industries for some loss of working time one man every 13 seconds, 277 men every hour, 2,500,000 men every year?

One must go to the battle fields of Europe for figures of comparable size with our accident lists in the destruction of man power. And the greater number of these industrial casualties are absolutely preventable. Furthermore, of these casualties civil engineering construction contributes in proportion to the number of workmen engaged a greater percentage than any other industry. Still again, this is the industry which has done least in developing and practicing safety engineering or accident prevention measures.

Construction is a hazardous industry. We cannot escape this fact, reason however we may. Our great fault as construction men is our tendency to consider construction hazards as not practicably avoidable, to accept accidents as inseparable from the kind of work that we perform. These are great errors. By far the greater number of the accidents which occur in construction work are entirely avoidable. Of those that occur despite precaution the greater number can be prevented from becoming serious in the way of human suffering and lost working time. These assertions are not visionary. They have behind them the proof of actual experience. Construction firms which have systematically developed accident prevention methods in prosecuting their work have greatly decreased the number of accidents and still more greatly reduced the cost of accidents.

Active coöperation of construction works' managers with the newly organized Construction Section of the National Safety Council, whose organization is announced in this issue, is urged. Study of accident prevention in construction is being forced upon contractors and builders by the multiplication of workmen's compensation laws, by increasing liability insurance rates, by the growing demands of workmen. The National Safety Council providcs a source of information eleswhere unequaled in means of accident prevention. Construction men can make this service more active and efficient by membership and support. By so doing they will help themselves while helping others.

American Forestry Units Are Working Fifty-Three Tracts of French Timber Land

Big Organization of Trained Men Is Relieving Wood Shortage for Army Construction Purposes—Central Committee Controls Acquisition of Sites—Close Utilization of Lumber

By Robert K. Tomlin, Jr.
War Correspondent of Engineering News-Record
Photographs by Committee on Public Information

At fifty-three sites in France American Army forestry units were operating on June 15. This is the information disclosed by a map which one encounters on entering the main office of the forestry section at the headquarters of the services of supply, American Expeditionary Forces. Plugged so full of long-shanked large-headed pins that it resembles a field of stubble, this map of France tells an interesting story of what our people are doing and planning to do in the matter of relieving the timber shortage for military construction purposes.

The development of the lines of communication for the American forces over here has called for a tremendous quantity of lumber for building construction. To recite in detail the uses of timber which are made by our army engineers would take many columns of space. Let us remember that we are engaged upon a gigantic program of building and timber supply which includes docks at our base sections, thousands of wooden warehouses for the storage of supplies, barracks at cantonments, hangars and shops at aviation centers, poles for telegraph and telephone lines, duck boards and revetment frames in the trenches, and planks for timber road construction near the front. The demand for this material has come not in easy stages, but at one time, creating a peak which, under present conditions of transatlantic shipping, could not possibly have been flattened out by relying solely upon cargoes of lumber brought from the United States.

Soon after our entry into the war, therefore, it became apparent that an entirely new service would have to be created for the American Army in France. We needed lumber in large quantities, and the only way to get it quickly was by going into the French forests for it. The decision was reached to organize two forestry regiments, and with the coöperation of various lumber organizations in the United States the West and South were combed for men experienced in this line of work. They were formed into two units, the 10th and 20th Engineer Regiments, which, reinforced by service battalions, represent now a total of about 15,000 men. Included in this organization are also many specialists obtained from the personnel of the United States Forest Service.

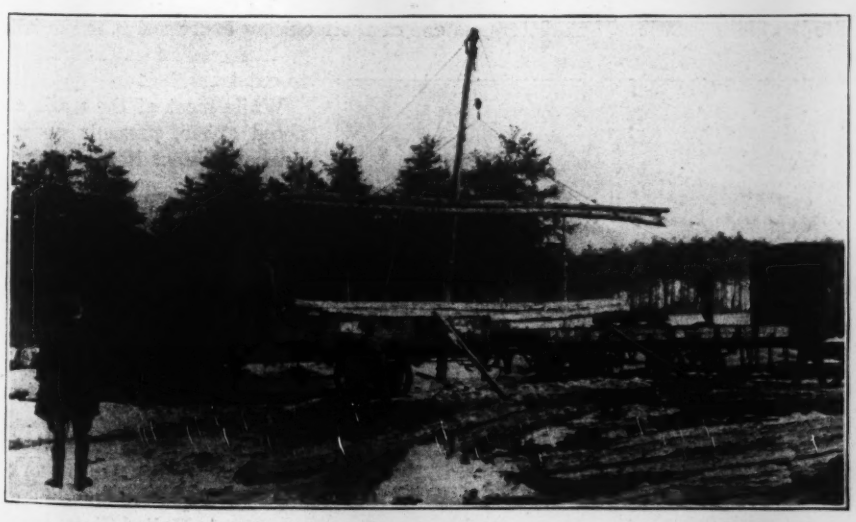
The object of the forestry work is to produce wood products, not only for the American Army, but also, to a limited extent, for those of our British and French allies. It was necessary, first of all, to establish a definite policy concerning the acquisition of timber land for military consumption. To have turned our forestry forces loose in France under instructions to get lumber where possible would have resulted in serious complications. In the first place, both the French and the British are engaged in forestry work, and conflict with their activities would have resulted. As a solution to this problem of allocating the raw materials, there was formed some time ago the *Comité Interallié du Bois de Guerre*, with headquarters at Paris. Its membership

includes representatives of France, Great Britain, the United States and Belgium. This committee controls the acquisition of timber lands throughout France and the distribution of areas among the forestry forces of the several allied armies. Without it the allied forces in France would have found themselves in the position of bidding against one another for the privilege of cutting lumber, with the probable consequence of steadily soaring prices. All offers on the part of owners of timber land must now go to this committee and be acted upon by representatives of all the allied armies in conference. The committee is also charged with the examination of sites and the matter of price fixing. It is informed regularly of the needs of the several armies, and can thus decide intelligently to whom newly acquired tracts should be turned over.

MAXIMUM OF TIMBER IS UTILIZED BY SAWING TREES CLOSE TO GROUND

Like practically everything else in France today, timber resources have long since been mobilized for war purposes. There are various sources of lumber, some of these under state, others under communal and still others under private control. Then, too, there are importations of timber from Switzerland and Portugal, these countries having, for example, supplied a large quantity of barrack lumber and railway ties for the use of the American Expeditionary Forces. It is obvious that without some centralized jurisdiction such as is furnished by the *Comité Interallié du Bois de Guerre*, the forestry units of the allied armies would frequently be working at cross purposes. Acting as the sole medium for the acquisition of the standing timber in France, the committee has been a big factor in coordinating the legal and administrative work involved.

The need for the forestry units serving with the American Expeditionary Forces was shown by the experience of the British and French, who have equipped troops for the sole duty of running mills and producing lumber. The 10th Engineers was organized originally for the purpose of aiding the British. Following the old system of organization, it consisted of two battalions. It soon developed, however, that the bulk of these men were needed for producing timber for the American Army. It was decided, therefore, to defer aid to the British until our own wants could be filled. So urgent was the call for timber products that a second forestry organization, the 20th Engineers, was formed. It did not follow the old system, but was expanded to 10 battalions, in addition to a number of service battalions attached to it. I am informed that the 20th Engineers is the largest "regiment" organized by any army. With the arrival of the 20th Engineers in France, it became possible for us, on account of the large number of men at our disposal, to give some aid to our allies, and accordingly one battalion of the 20th was assigned to work for the French and one for the British. In the makeup of our forestry regiments men with experience in woods work, sawmill work or the technical features of forestry are mainly required.



OF ROUND LUMBER THE BIG DEMAND IS FOR PILES AND TELEGRAPH POLES

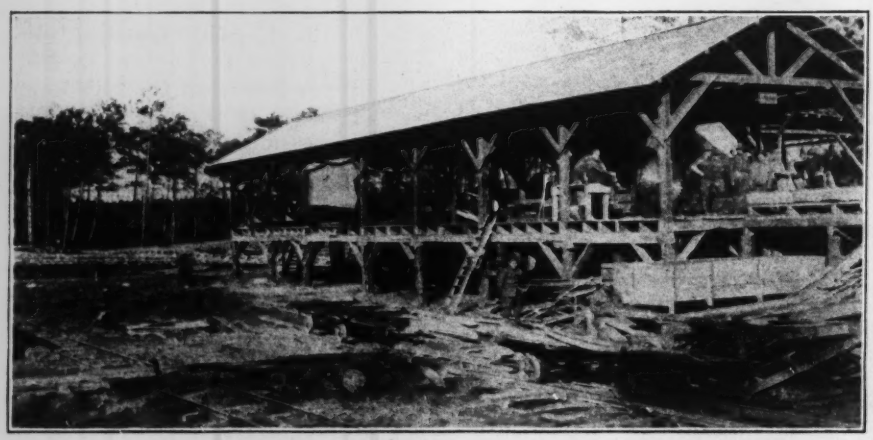
UNLOADING TREE TRUNKS AT ONE OF THE NUMEROUS AMERICAN ARMY SAWMILLS IN FRANCE

The duties are largely specialized, and the only type of men who can perform them adequately are those who have had years of training in civil life.

Before our forestry units left the United States, it was foreseen that work in France would probably involve certain changes from our own methods. In order that our units might be sent over here properly trained and properly equipped for the work to be done, the chief of the United States Forest Service made a trip to France, studied local conditions thoroughly and organized the work of the forestry section of the Army during its initial stages.

Conditions affecting the production of timber from French forests are in some respects different from those in the United States. In the first place, no such large scale operations as are common in America can be conducted here. As a general rule, our forestry forces must work small tracts of timber—small, that is, in comparison with some of the vast timber resources of the American Northwest. Thus, at the beginning, it was necessary to organize crews and secure machinery and equipment suitable for medium-scale operations. The program resolved itself, therefore, into one of working many small tracts, often widely separated, instead of one large centralized forestry project.

From the physical standpoint forestry operations in France present no very great difficulties to American lumbermen. The important point is to adapt equipment and machinery to the varying conditions found at the sites selected for working. Then, too, our methods must be altered somewhat to conform with French forestry practice, which is far more conservative in the utilization of timber than our own. In normal times the French cut only about as much timber as the forest produces and these cuttings are much lighter than those of American practice. Inasmuch as we are on foreign soil, we must adapt our work of forestry to the wishes of those who control the rights to the timber lands. French practice insists upon a very close utilization of materials in its logging and milling operations, much more so than is usual in the United States. For example, the cut is made very low down on the stump of the tree, and in order to meet French requirements our foresters, as one of their officers expressed it to me, are "getting down on their knees to cut trees."

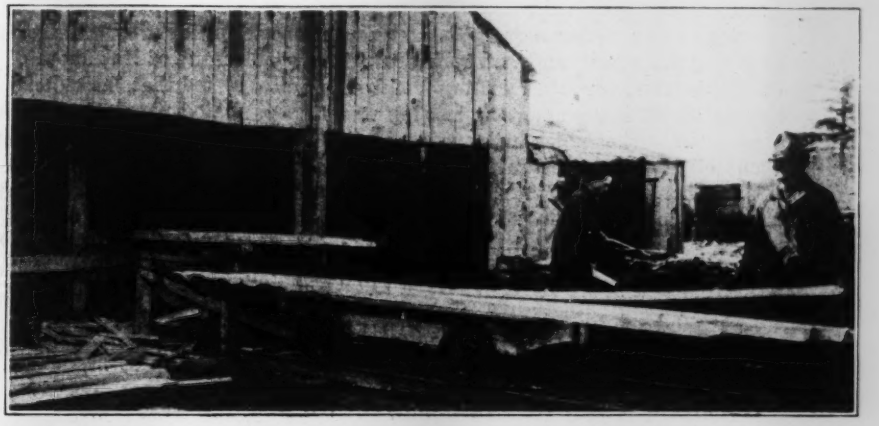


THIS IS TYPICAL OF THE AMERICAN ARMY SAWMILLS

While most of the work, as noted above, presents no remarkable difficulties more elaborate plant layouts are called for in the regions in the vicinity of the Vosges and the Jura Mountains. Here special methods are employed. Among them is the use of an incline at 35% grade down which logs are lowered, by means of a donkey engine, from a plateau to the mill.

At most of the sites where our forestry units are working all types of machinery common to United States prac-

tice are used, except that there is no steam logging involving cable haulage by donkey engine; this scheme of operation is considered too destructive for the French forests. The method employed generally is to bring the logs in by team haulage, motor trucks, log wagons or narrow-gage railways. In a few cases, floating of logs on watercourses is possible. The felling of trees is accomplished both by sawing and chopping. Saws are used for the felling of the pines and firs while the small hard woods are chopped, for chopping insures a better subsequent sprouting of the tree.



PLANK IS IN GREAT DEMAND FOR BUILDING CONSTRUCTION

Our lumber mills, as shown in one of the photographs, are set up and operated like those employed in the United States. In fact, practically all of the mechanical equipment in service in our forestry work was shipped from home. At these plants, steam power is universally employed. The fuel is sawdust fed into the firebox of a Dutch oven, and other material such as slabs and refuse are burned. The Dutch oven is not common in France, and its operation over here by our troops is said to have created a very favorable impression.

The mills are provided with carriages, on which the logs ride against the saws, and roll ways and benches over which the sawed material travels. Then, too, there are edging machines and special mills for the production of railway ties.

RAILROAD TIES FOR THE USE OF THE AMERICAN ARMY

Because of the present enormous demand for lumber by the American Army our mills are being forced far beyond their rated capacity; for example, mills having a normal output of 10,000 ft. per 10-hour day have been producing nearer 20,000 ft. of lumber in 10 hours, or 38,000 ft. in two shifts per day.

Among the species of trees which we are cutting are pines—by far the most common, and including a Scotch pine similar to our own Norway pine and a maritime pine resembling the Southern yellow pine—fir similar to our Western white fir, oak, beech, ash, hornbeam, spruce, poplar and basswood. The pine country is in the south of France. Most of the trees in this region have been tapped for resin. The pine lumber is being furnished largely for the construction of buildings of various kinds required by the Army. The big demand for spruce comes from the airplane manufacturers. The Red Cross has called for basswood with which to make artificial limbs for the wounded.

Not all of the lumber has to be sent through the mill. The forestry units are supplying large quantities of piling, prop material, telegraph poles, posts and stakes for supporting barbed-wire entanglements, cordwood and fascines. Railway ties can be produced by hewing and need not go to the mills. These are the main uses of the so-called round timber which requires no milling.

Of the mill products, plank for road construction in the shelled areas behind the front and lumber for sheds and buildings are important items. A number of various sizes, including runners for trench boards, are in demand.

A big project in connection with our forestry operations will be the installation of excelsior plants to produce material for mattresses needed at army camps. Excelsior is considered preferable to straw and hay which have been employed up to the present. The power demands at the excelsior plants are so great that they cannot be made accessories to existing lumber mills. Separate installations for the production of excelsior will become necessary and forest areas will be taken over to supply raw material for this specific purpose.

Our total output during the month of June was 26,727,500 ft. b.m. of sawed material, 265,151 railroad ties, 150,359 ties for light railways at the front, 190,702 poles, 7518 piles for new dock projects and 67,500 steres of fuel wood.

The following instance illustrates the pressure under which our men are working, and what it is possible to do to meet military necessity: The 10,000-ft. mill operated by C Company, 10th Engineers, in southern France

had to be moved recently to a new site on account of the exhaustion of the timber supply at the point where it had been operating previously. The whole outfit was moved 35 kilometers and began cutting the first log at the new operation 47 hours after the last log was cut at the old operation. The boiler and engine of this mill weigh about eight tons. The problem of quick moves is one of our most important ones, because of the small size of most French forests.

Baltimore Area and Waterfront Doubled by Annexation

New Boundaries Being Tied Into Old Triangulation — Topographical Survey and City Plan for New Area To Follow

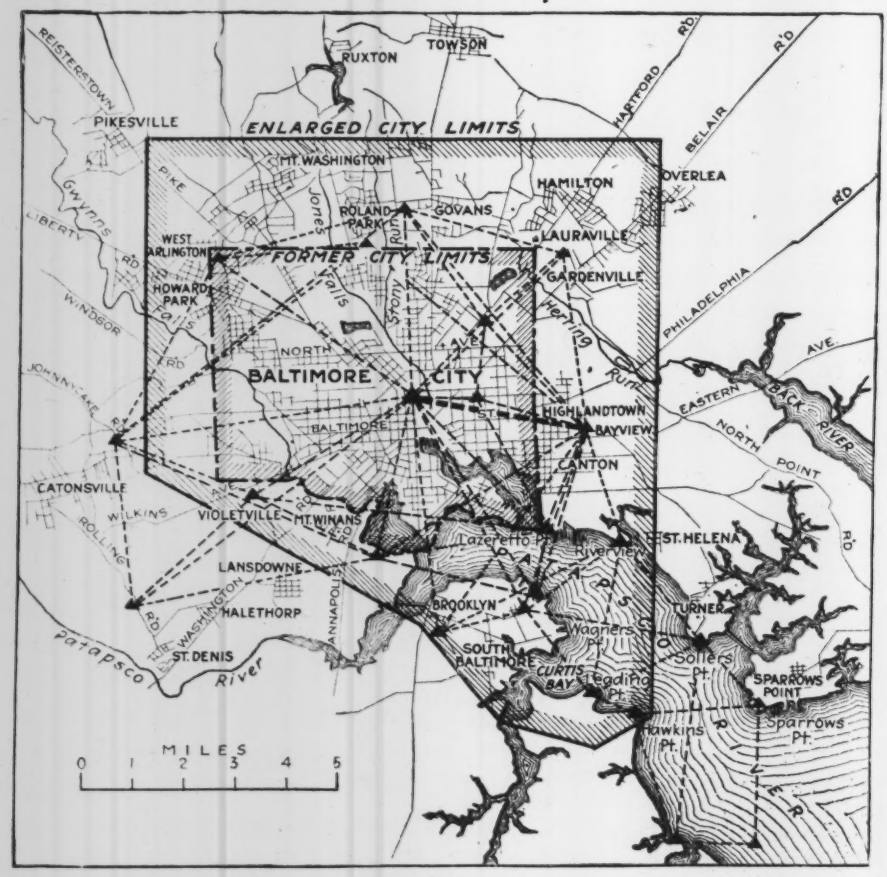
By Joseph W. Shirley
Chief Engineer Topographical Survey Commission, Baltimore, Md.

COUNTING land and water, the area of Baltimore was increased by 52.83 square miles, to a total of 95.32 square miles, by the annexation act which went into effect June 1 last. No time was lost in starting surveys to establish the new boundary lines.

The passage of the annexation act was the result of several years' effort on the part of the citizens of Baltimore to add to the city a number of outlying settlements which were practically a part of Baltimore, but not included within its corporate limits. The act was prepared by a committee of citizens known as the Non-Partisan Greater Baltimore Extension League. The census of Baltimore of 1910 was 558,000, and it is estimated that the old city has grown to 632,000. The estimated population of the area recently added is 65,000, assuring Baltimore of a population of about 700,000 at the next census. The waterfront of the new addition adds approximately 15 miles to the 15 miles already within the city limits, and offers a wonderful opportunity for development upon a comprehensive scale.

The task of surveying and staking out the new boundary was, by the act of the legislature, placed upon the Topographical Survey Commission of Baltimore, and requires the running of about 40 miles of boundary line and setting up approximately three hundred boundary stones or markers.

In 1888 Baltimore extended its limits about two miles to the north and about the same distance to the west. Shortly thereafter the Topographical Survey Commission was appointed and an appropriation was made for a complete topographical survey and map covering the entire city. In making this survey and map the most accurate methods were employed. As a basis of control, a triangulation system, composed of 18 primary stations, was established, having for its center the Washington monument. This system was based upon the surveys made by the United States Coast and Geodetic Survey, and the methods used by that organization were employed. About 7000 points were placed upon the ground, and their positions, relative to the Washington monument, were computed. These traverse stations were used to obtain all field data for the preparation of the final plat. This plat was made on the scale of 200 ft. to 1 in. with 5-ft. contour intervals, and shows all existing highways, houses, railroads and other improvements. With a map of this character it was possible to plan, in a comprehensive way, for the development of the territory over which the city had control. The locating of the new boundaries for Baltimore calls for the employment of the most careful and accurate methods. The Topographical Survey Commission has been carrying on this work for a few months, and has based its surveys upon the triangulation work previously done. New stations have been established in the vicinity of the boundaries, and their locations have been fixed by observations taken from at least three of the older stations. A traverse line has been run over the boundaries and will be tied in



BALTIMORE'S EXISTING TRIANGULATION WILL BE TIED INTO NEW BOUNDARY LINES OF THE CITY

with these new triangulation points. When this is done the relative location of the traverse points to the points along the boundaries can be computed and the boundaries staked out.

It is proposed to mark the new boundary line with concrete markers with bronze centers, set below the surface of the ground, accessible through a concrete box and metal cover. Each of these markers will be made a precise level bench mark.

Upon the completion of the marking of the boundary line surveys will be made to extend the topographical map previously made to cover the entire area now belonging to Baltimore, and a plan for the proper development of this area will be prepared.

Draw Pier of Portland Bridge Settles Three Feet

Bridge in Maine City Put Out of Service Temporarily by Sinking of Concrete Pier Resting on Piles

ON AUGUST 27 the southern draw pier of the Portland bridge, in the harbor of Portland, Me., settled about 3½ ft. and moved longitudinally downstream about 20 in. Although the cause of the trouble has not yet been determined, the engineering interest in the occurrence is sufficient to warrant the following statement of what has happened, furnished at the request of *Engineering News-Record* by J. R. Worcester & Co., consulting engineers, Boston, who had charge of the design and construction of the bridge.

This bridge was completed in the summer of 1916 and opened to the public on July 20 of that year, and has been in constant operation ever since. It was described in *Engineering News* of Oct. 28, 1915, p. 824, and Nov. 4, 1915, p. 319 and *Engineering Record* of Mar. 4, 1916, p. 319. The bridge over the harbor is a deck girder bridge carried by steel girders supporting a concrete floor with wood pavement for a wearing surface. The steelwork rests on masonry piers supported on spruce piling. The drawspan consists of a double-leaf Scherzer rolling lift draw. The pier which failed is on the southern side of the channel and carries one leaf of the Scherzer span together with a truss span.

The pier was constructed in the following manner: The bottom of the harbor was dredged for a depth of 10 or 12 ft. at the location of the pier, after which piling was driven to a satisfactory resistance and piles cut at El. —41. A concrete scow 4½ ft. deep was built on ways on the shore in the immediate vicinity. This scow was built on a 3-in. plank platform on which were constructed the forms to receive the concrete. Around all sides of the scow there was a projecting flange through which projected hooked bolts. On this flange wooden sides of 12 x 12-in. hard pine posts, with 4-in. hard pine planking on the outside, were built up about 18 ft. high. The whole structure was then calked and launched. In order to give the boat more stability a certain portion of the concrete scow was filled with concrete near the site of launching, and the scow was then towed to its correct position and the concrete filled in until the scow had settled onto the piles at low tide. Water was then pumped into the caisson between the sides of the caisson and the shaft of the pier, until the caisson became heavy enough to remain in position at high water. The work of building up the concrete to El. —2 was then carried on and the upper portion of the pier, which was of granite, was completed. After all the masonry was completed the sides were freed at the hooked bolts by a diver and were floated to the surface.

Last spring the draw showed signs of difficulty in locking and unlocking and considerable power had to be applied to operate the locks. Upon making measurements it was found that the pier had moved downstream, that is, transversely of the bridge, about 5 in., but no appreciable settlement had taken place. Measurements were taken from time to time to ascertain if this motion was increasing. It did not seem to show any material increase, but at the same time the draw was operated with increasing difficulty from week to week. It was finally deemed advisable to attempt to jack up the ends of the truss span which carried the Scherzer leaf and place rollers underneath these end bearings and push the end of the truss span back into line. Owing to the impossibility of getting sufficient jacks to jack both ends at the same time, each end was lifted independent of the other about 1½ inches.

Bearing plates were inserted on top of the masonry and rollers inserted between the bearing plates and the under side of truss shoes. After this operation had been completed on both ends the leaves were closed, and when locks engaged the leaf which was out of line rolled back about 2 in. of its own accord; after a day or two jacks were placed against the sides of the truss shoes and the span was moved back very close to alignment. After this had been accomplished all difficulty in opening and shutting the drawspan ceased. This operation of lifting and jacking over the trusses to line was completed Wednesday, Aug. 21.

Pier Moved Downstream Again

Four days later the draw tender commenced to notice a recurrence of the difficulty in locking and unlocking the draw, and after an examination of conditions it was ascertained that the pier had moved downstream in the same direction as before, about 3 in. more, up to Aug. 25. On Aug. 27 the motion of the pier became very noticeable, and in the afternoon of this day it was considered wise to close the bridge to traffic. At this time the pier was moving downstream at the rate of about ⅛ in. every ten or fifteen minutes. As this motion of the pier was multiplied at the center of the drawspan it was considered wise to open the draw at this time to prevent any damage to the other leaf. The leaves of the draw were therefore opened sufficiently to disengage the jaws, and almost immediately thereafter the pier started to move downstream and settle at the same time.

The movement of 20 in. downstream and 3½ ft. settlement took place within 15 or 20 sec., after which the pier brought up, and the settlement became very slight for the next few hours. In fact, during the first night the pier settled about 2 in. and moved downstream 1¼ in. During the second night it only settled ½ in. more and moved downstream about ¼ in. The motion has now practically ceased, and the pier has come to rest.

It was found impossible to raise the leaf of the draw-span resting on this pier by electric power, because the electric feed cables pulled out and short circuited. Also, the two tracks upon which the Scherzer leaf rolled were at different elevations, the eastern one being about 15 in. higher than the western one, and both inclined toward the channel. The steelwork of the truss span was not badly affected, although the lateral bracing was badly bent in one instance and there was also a slight distortion of the bottom chords in each panel. The drawspan seemed to be intact. The pier above water showed no evidences of distortion, as all joints were solid and free from cracks.

Since the accident the floor of the Scherzer span has been stripped of all paving and planking and the load materially reduced, and the two tracks supporting the Scherzer span have been brought practically to the same elevation. After this was completed the workmen were able to raise the draw by the hand mechanism, thereby freeing the channel for water traffic. The southern half of the ship channel was obstructed by this leaf from 4 p.m., Aug. 27, to 6 p.m., Sept. 5. Only small craft could pass.

Work has been commenced on dismantling the Scherzer leaf and the truss span, and in all probability these will be floated away on large lighters to temporary piers nearby.

A series of borings have been started about the pier, and up and downstream from the pier, to verify the original borings. It is the intention to carry these borings somewhat deeper, in order to detect any possible poor strata which may be situated at a greater depth. As yet no conclusion has been reached as to the probable cause of the movement of the pier.

City Planning is Closely Related to Public Safety

By Thomas Adams
Town Planning Adviser, Commission on Conservation, Ottawa, Canada

and

Harland Bartholomew
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Extracts From Paper Read Before National Safety Council, St. Louis, Sept. 17—Street Circulation, Widths, Curves, Grades, Building Heights and Zoning, Open Spaces and Playgrounds May Be Planned to Keep Down Accidents—Illustrations From Conditions and Experiences Incident to Defective Planning at St. Louis

CONSTANT increase of population in large cities has been accompanied by an ever-increasing danger to human life and health. This danger is not caused by the growth of the large cities, but by the haphazard and unregulated manner in which the growth takes place. Few cities in America, if any, are not provided with ample space in their streets and surrounding their buildings. As a whole, they are amply provided with street space and air space, but in spots they are badly congested both in respect to population and traffic. The fault lies in the lack of proper distribution and control of the density of building, on the one hand, and on the other hand in the lack of scientific planning of the street system to secure the best means of circulation of the traffic. For instance, St. Louis is far from being a congested city, but it has badly congested spots; its streets are more than adequate in their total capacity for traffic circulation, but they are not of adequate width in the right place.

Street Circulation and Building Density

In a properly planned city consideration has to be given not only to the needs of through circulation of traffic between its different parts, but also to the building density on the lots fronting on the streets. Both these things have to be regulated together, or planning will prove ineffective as a means of preventing congestion. Many European cities with comparatively narrow streets have better and safer means of circulation for traffic than some American cities, because of the lower density and height of buildings. City planning is needed to govern, among other things, the relation between the width of street and the height of buildings, and the ideal to aim at, however difficult of attainment it may appear to be, is making the height of a building correspond to the width between its front wall and the front wall of the building facing it. Until we can reach that seemingly difficult standard we shall not be able to obtain space in our streets to enable us to get rid of congestion of traffic and consequent dangers to life and loss of valuable time to citizens.

Plan for Future Generations

Accidents caused by street cars and automobiles and untimely deaths from diseases which result from unplanned street systems and congestion of population account for a considerable proportion of any city's death rate. The admirable and extensive methods of handling traffic, and the various public health campaigns, are responsible for the conservation of many thousands of lives each year, and the unabated continuance of these methods and campaigns is highly essential, for even had we been permitted to foresee present conditions, we could scarcely have been able to forestall entirely their attendant dangers. In the light of present conditions, however, we can at least remedy for future generations some of the fundamental defects of our present city growth. This is the task of the city planner.

In planning, replanning and reconstructing cities an effort should be made, as far as practicable, to carry out the following objects, among others, in regard to streets, buildings, and open spaces for recreation:

Heavy traffic streets should be wide, and those which carry street railways should not be less than 100 ft. in width. Directness of route should be sought for main highways, free from the right-angled turnings, abrupt endings, irregular crossings and collision points caused by rectangular planning. On hilly sites, reasonable curves, with a clear vision of a hundred yards at all

points, should be substituted for straight, steep grades. Sharp curves should be avoided and those existing should be done away with. Bad grades should be avoided, particularly at intersections. More than four streets should not be made to converge at one point unless large traffic space is provided at the point of convergence. Frequently the rounding of sharp, angular corners at street junctions will do more to relieve congestion and prevent accidents than widening of the interior of the street. The street railway systems of cities should be planned or replanned with the object of securing general convenience, and not for the interest of a few property owners. New bypass streets should be created in many cases; this is preferred to widening existing streets, so that traffic is distributed rather than concentrated. Main radiating routes should be supplemented by wide, circular routes at the inner and outer circumference of the city, so as to cause traffic distribution before it reaches the center. In residential areas narrow streets should be designed and restrictions made limiting the height of the residences to two or three stories and preventing change in character of buildings. The narrow streets should be so planned as to discourage through traffic. The whole street system should be planned for various widths in relation to building use and density and prospective traffic requirements.

Intersections should be planned to make it certain that all traffic may move either at right angles or in a gyratory form in a circle of ample radius (not less than 100 feet).

Building set-back lines should be fixed on all streets, but particularly where streets of comparatively narrow width cross, so as to permit of a better view of the intersection and all approaching vehicles.

Building Heights and Zoning

The ideal to be aimed at in regard to height of buildings should be the limitation of the height to the width of the street in the front and to the width of the space between the rear walls of buildings. Only thus can we give effect to our measures to prevent congestion and obtain the benefit of street improvements. The amount of superficial area of a lot to be built upon should not exceed 75% in the business area and 50% in residential areas, except on corner lots.

These standards may seem to be so much in advance of present-day practices that they are not likely to receive the sanction of public opinion, but the time is approaching when they will be adopted and enforced. Cities should be zoned for purposes of limiting different heights and densities in different districts, and prescribing manufacturing, business, residential and other uses of property—the street system having been simultaneously planned to suit these different uses. This has been done in New York, St. Louis and other cities, but the standards so far attainable are not yet adequate to reduce possible congestion. The spreading out of cities on a more even basis, less congested in some parts and less blighted or scattered in other parts, is not only essential to relieve congestion and obtain safety, but is needed for a more equitable distribution of property values in the interest of owners.

American cities are, generally speaking, adequately provided with open spaces for recreation, but those rare instances where these spaces are in the right place and are properly distributed to be accessible to the population have been the result of accident and not of design. The reduction of street space in residential areas, and the lessening of building density on lots, will be made more practicable and beneficial if they are accompanied by the provision of playgrounds in every district. Such provision is necessary to reduce the use of the street as a playground. Large parks are of great value to a city, but they do not lower the need for recreation spaces in close proximity to the homes of the people. City planning schemes should not only have regard to the placing and designing of playgrounds and parks, but should lay down some principle under which the provision of a percentage of all land to be subdivided in future should be set apart for recreation. In some provinces in Canada and in certain schemes in England it is provided that one-tenth of any area subdivided for building purposes shall be left as a public open space. This is required in the same way as street space is required to be left free of building, as a condition on which land is subdivided for building purposes. Land which is least adaptable for building is often best suited for playgrounds, and the giving of such land to the public by the owner does not necessarily mean that he loses its value. The fact of its being given as an open space adds to the value of the surrounding land for building purposes, and makes it practicable to have less space devoted to streets. It is well known that one of the chief causes of loss of life on public streets is the fact that many city children have no other places on which to play.

What Is Being Done in St. Louis

A few illustrations of what St. Louis is doing in city planning may serve to show what can be done to increase public safety. There has recently been adopted a zone plan for regulating the height, area and use of all buildings. While the regulations apply principally to new structures, except where a change of use in an existing building is made, it is confidently believed that in a very few years there will become well defined lines of demarkation between the residential, commercial and industrial districts. As a result, industries and stores will be eliminated from the residential districts and, particularly in the congested sections, children will be more free to play without the danger of accident from the teams and trucks which serve the industry or store. Furthermore, the separation of residential from commercial and industrial districts will produce more desirable homes free from noises, smoke, dust and odors of the commercial or industrial institutions, and the danger to public health will thus be greatly diminished. Today the industries are spread promiscuously throughout the whole city. Eventually, under the zone plan, it is believed that industries will group themselves into certain natural districts which will simplify their own methods of transportation and prevent much of the present intermingling of commercial and pleasure traffic. This should serve to increase greatly the safety of both kinds of traffic.

St. Louis is gradually developing a system of major streets so located and of such width as to accommodate the greater part of all traffic throughout the city. This

system will considerably simplify the traffic movement and hence greatly increase the public safety. Congestion of traffic at any one place, in any one district or on any one street will be eliminated, thus avoiding one of the greatest contributing causes to frequent accidents. The major streets will be so planned as to avoid sharp curves, irregular intersections and bad grades. Where feasible a separation of different kinds of traffic will be made. By this development of major streets it becomes possible to reduce traffic on the minor residential streets, decrease the roadway width, lay less expensive pavement and thus discourage anything except local traffic, all of which increases the public safety.

In the matter of public recreation, the new playgrounds, so far as practicable, are being located on minor streets and in accordance with the distribution of children who will use them, thus reducing the distance children must travel to the playgrounds and the consequent danger of accident.

Considerable attention to questions of public safety has been given by the police department of St. Louis, the Division of Streets and Sewers and the Chamber of Commerce. The police department has a traffic squad of 42 men. Where traffic is densest certain "congested zones" have been designated by ordinance, by which the parking of vehicles is regulated, traffic lights are placed, traffic police are stationed and all street intersections are marked off for vehicular and pedestrian movement.

Street Accident Map Is Useful

An interesting study was made in the form of an "accident map" which shows by black circles of proportional size the number of accidents which occurred at various points in the city throughout an entire year, as reported by the police department and the street railway company. This map has been quite useful in determining particularly dangerous points, acquainting the motormen and police with them, in locating traffic lights and traffic police, signs, etc. In several cases the cause of accidents has been determined by special study and a change of curb radius, a different pavement, a change in the crown of the street or improved lighting has served to reduce the danger.

From a city planning standpoint, however, this map teaches one of the most graphical lessons possible. It shows, for instance, that more accidents occur within a short distance of Grand Ave. than any other street in the city. This is not because certain other streets do not carry more traffic, but because within a comparatively short distance five of seven streets cross Grand Ave. irregularly, and Grand Ave. is an unusually busy street only 80 ft. wide and carrying a much used car line. More accidents occur at Grand Ave. and Washington Ave., in this district, than at any other point in the city. Unquestionably this is due to a collision point created by the jog of about 200 ft. which Washington Ave. makes at this point, forcing all of its great volume of through traffic to traverse Grand Ave. for that short distance of 200 ft. Fortunately, this irregular offset is now being remedied by the removal of the northeast corner of the intersection, making possible a direct crossing of Grand Ave. for all Washington Ave. traffic. The cost of correcting this intersection is about $200,000. The correction is part of the Washington Ave. widening project, the total cost of which is $552,000.

Another interesting illustration from the "accident map" is Locust St., the most intensively used traffic thoroughfare in St. Louis, which carries about 1,700 vehicles per hour during the rush hours. East of Jefferson Ave. to 12th St., a distance slightly less than one mile, it has a width of 72 ft. West of Jefferson Ave. it is 60 ft. wide for about an equal distance. Where the street is narrow there were accidents at every street intersection, there being 93 in all. Where the street is wide there were accidents at only two points—at 18th St., a car line crossing, and at 13th St., where there is a bad curve at the Public Library. This is more or less conclusive proof of the desirability of using wide streets for heavy traffic thoroughfares if accidents are to be avoided.

Need Permanent City Planning Organization

There are other problems connected with public safety which are incidental to the planning of streets and regulation of buildings, but which can only be touched upon in this paper. The relation between the plan of the city and the plan of the interurban tramway tracks is an important problem. The proper development of interurban transportation helps to relieve congestion in the center but it adds new dangers to life because of the careless disposition of tracks and crossings. The city planner has to consider the desirability of separating the space used by these tracks on existing highways, how to avoid dangerous crossings, and how to plan routes on private rights-of-way to obtain high speed. The mixture of fast moving and slow moving traffic in central areas is a cause of serious difficulty. This prevents free movement of fast traffic, and thereby is one of the chief causes of congestion and danger. It cannot be entirely obviated, but may be greatly lessened by proper planning of the street system of the city.

The whole question of reservation of rights-of-way for street cars and interurban tramways, separation of slow and fast moving traffic, needs to be studied and investigated more carefully. Indeed, every aspect of the question dealt with in this paper needs to be investigated scientifically by a permanent city-planning organization in each city engaged in continuous study of the problems of city growth, and helping by plans and schemes to create cities of the future that shall be worthy of Western civilization.

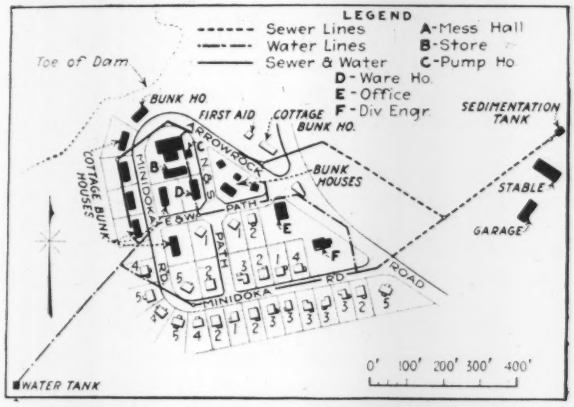
Must Lift Road Drags at Railway Crossings

In the use of road drags and scrapers over grade crossings care should be taken to avoid filling the track flangeways, states a circular issued to county superintendents of highways and local highway authorities in Illinois by the Public Utilities Commission. It has been found that operators often fail to raise the drag or blade, and loose earth thus filled in along the rails may cause derailment of light motor section cars and speeders, while stones or packed earth may endanger trains. The circular suggests that road men take care to raise the drag or scraper, and that they also examine the crossing and remove earth or other obstructions as quickly as possible.

Construction Camps Model Towns on Miami Flood Works

Villages of Homes, With Schools, Community Halls, Markets, Water Mains, Lights and Sewers, House Workmen at the Five Large Dams Being Built

WORKMEN will live mentally and socially as well as physically on the construction work of the Miami Conservancy District. They will not be merely tenants of construction camps; they will be residents of village communities. Indeed, few dwellers in permanent villages possess the conveniences of public service, roads, schools and markets which these construction workmen will enjoy during their temporary residence of a few years at the great dam structures being built for flood protection in the Miami River Valley of Ohio. And, let the fact be emphasized, these unusual provisions of a construction camp have first of all the very practical purpose of holding men on the job. The humanitarian element has, of course, not been absent from the thoughts of those who have planned these unique communities, but, when all has been said that can be said of this influence, the impelling motive in their creation has been reduction of labor turnover.

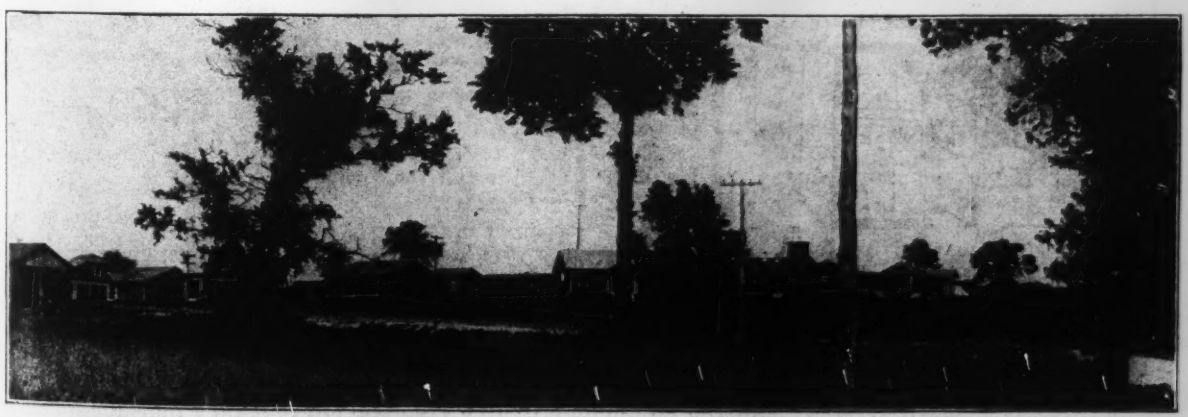


BUILDINGS ATTRACTIVELY GROUPED WITHOUT SACRIFICING COMPACTNESS OF PLAN

Construction camp practice was for several reasons a problem of prime importance on the Miami Valley flood protection work. As a notable example of community construction it was felt that a model in camp practice should be established. The work involved, as planned, construction by machinery to an extent not often witnessed on works of similar character. To a greater extent than usual, therefore, the workmen employed would be skilled machine runners and artisans, the kind of workmen whose standards of living were good, and also the kind of workmen whose frequent loss would most interrupt the construction schedule. Attractive living conditions on the job were needed if workmen of this class were to be retained. This was particularly the case since industries connected with the war were offering unusual inducements in the way of high wages and excellent housing to every sort of skilled workman which they could reach.

Besides the channel improvement work, largely in the cities of Dayton and Hamilton, the flood protection plans called for five large dams. These were scattered over an area of many square miles at places remote from towns and from one another. Each required three or four years to complete, including construction plant installation and removal. Even if any of the existing villages had been near enough for workmen to get readily to and from the nearest dam, none was large enough to provide living quarters for any considerable number of the two or three hundred men, many with families, employed at each dam. Also, since their sites were widely separated from one another, a central camp, within ready reach of all the dams, was impracticable.

It was obvious that there must be a construction camp at each dam, and this was the decision made. Another conclusion was that each camp must be of such a character and so conducted that workmen would be attracted and would remain satisfied residents. Here the decision was not so easy. Merely to conceive, design and build a fine camp, or even a luxurious camp, was not the problem. A camp had to be designed and built which would meet the requirements for attractiveness and for which the *net investment* would not burden the work with too heavy an item of construction cost, nor, on the other



CAMPS ON MIAMI VALLEY FLOOD WORKS SPICK AND SPAN IN APPEARANCE AS SUBURBAN VILLAGES

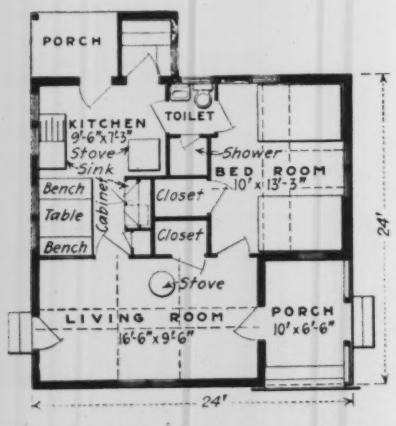
COTTAGE BUNKHOUSES PLANNED TO ACCOMMODATE A FAMILY AND SIX BOARDERS

hand, put so high a housing charge on the workmen that they would refuse to pay it. Only by the prospect of realizing a high salvage on the camps after construction had been completed could the condition be met.

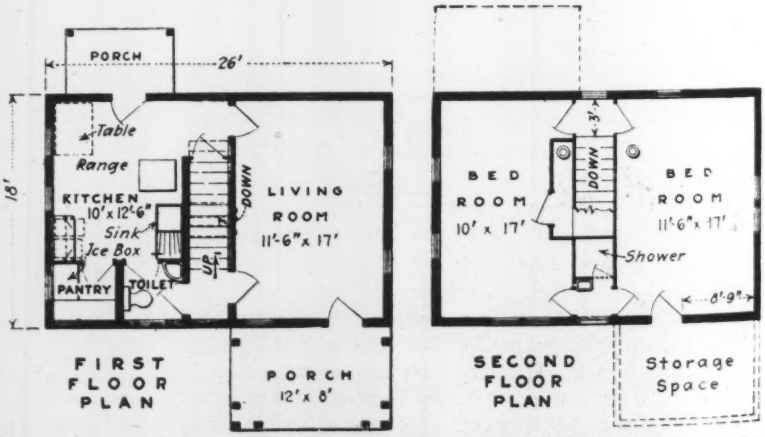
Ordinarily, much salvage from a construction camp is not possible. Furnishings and utensils, perhaps windows and doors, and to some degree the lumber in the buildings, can be saved in part for reuse, but the camp structures have no value as buildings. On the Miami flood work conditions made more comprehensive salvage methods appear possible. The dams are situated in really beautiful hilly country. When grassed over and cleared of débris, and with roads constructed along the crests of the dams, the dam structures will add to rather than detract from the scenic attractiveness. At all but one of the dams the great borrow pits in the river valley from which the embankment material is to be pumped will form beautiful lakes of living water. All of the sites are within easy automobile rides of cities of considerable size, and most of them are on or near railways or interurban lines. In every respect the situations and surroundings are such as might well attract persons who seek country residences for their families in summer or who, working at gardening or in the many industrial works of Dayton, prefer year-around residences away from the crowded living quarters of the city. It seemed reasonable to those directing the flood works that construction villages of inexpensive, well built, attractive cottages, with plenty of yard room, and bordering graveled streets and walks, would find purchasers and tenants after they had been vacated by the dam builders. The prospect of such a market, it was thought, warranted placing a considerable salvage value on the camp buildings. This in turn made it possible to provide for the workman a type and quality of housing accommodations which under ordinary construction conditions could not be accorded.

Villages were laid out on the hills above the dams, and advantage was taken of the topography to secure variety in location and frontage of buildings and alignment of streets and walks, without departing from the compactness of plan which would make the sewerage and water-supply systems simple and inexpensive and afford easy communication from one place to another. The plan reproduced illustrates a typical arrangement, and the views show the general appearance of villages most nearly completed.

Camp buildings are of two classes; first, general service buildings, such as mess halls, stores, etc., and, second, dwellings for the workers and their families. The second class includes individual cottages, cottage-bunkhouses, separate-room bunkhouses, and common-room bunkhouses, each providing a distinctive character of accommodation.



LIVING CONVENIENCES EMPHASIZED IN ONE-STORY COTTAGES



PRIVACY OF REFINED FAMILY LIFE FOR CONSERVANCY DISTRICT WORKERS PROVIDED BY TWO-STORY HOUSE PLANS

CAMP MESS HALLS IN PICTURESQUE SURROUNDINGS

Cottages are designed to provide family homes and are built in five styles. Variety of style provides both the difference in rental cost necessary to meet different incomes and the individuality which is essential to the attractive group appearance of the buildings. Dimensions and rental prices are indicated in the following tabulation:

Style	No. Stories	No. Rooms	Size	Rent per Month
1	1	3	24x24 ft.	$13
2	1	4	24x26 ft.	16
3	2	4	18x26 ft.	18
4	1	5	24x32 ft.	19
5	1	5	26x34 ft.	21

Rents are fixed on the basis that the cost of the cottage, less 40% salvage, shall be paid for in monthly installments during the period of the construction work.

Altogether, there are 125 cottages of all styles. Outside they are appropriately painted; inside they are cieled and stained. All are equipped with kitchen range and water heater, water closets, shower baths and laundry tubs. The heating will be by stoves. Windows and doors are screened. Each cottage has water and sewer connections and is wired and has fixtures for electric lighting. Light and water are included in the rent.

Cottages have been occupied about as fast as completed, and where the tenants have had time to clean up and get settled they present most attractive homes, with flowering vines and graded front and rear yards where another season will see grass and gardens.

TWO-STORY HOUSES ATTRACTIVE HOMES FOR WORKMEN IN HIGHER SALARIED POSITIONS

Bunkhouses provide lodging for the men without families. There are three styles; one called a cottage bunkhouse provides for a family and six single men boarders. These are so arranged that the family quarters are shut off from the bunkroom for the boarders. Another type provides for men who prefer to board themselves. It has one large bunkroom, a kitchen and a mess room, and is equipped by the district with cooking range, sink and tables, and cots with springs and mattresses but with no blankets. No rent is charged the men occupying these quarters.

Main bunkhouses have a porch, a sitting room, a wash and toilet room with a shower bath, and sleeping rooms accommodating two or four men each. A window at the head of each bunk gives light and ventilation, and heat when needed is provided by steam pipes running lengthwise of the building under a floor grating. Cots, springs, mattresses and blankets are furnished. These bunkhouses are built in several sizes to accommodate 8, 12 or 24 men each. The rental charged is 50c. per man per week when two or four men occupy a room. A man can get a small room alone for 75c. a week or a larger room for $1 a week. Generally the men eat at the camp mess hall.

ONE-STORY, THREE-ROOM COTTAGES HOUSE WORKMEN AND THEIR FAMILIES

Camp buildings for general service comprise a mess hall, a general store, a schoolhouse, a community hall and a first-aid hospital.

Mess halls will provide for about 200 men at a meal. Each is equipped with a bake oven, a range, an electric griddle, a vegetable steamer, a meat block, a steam serving table, a dish-washing machine, refrigerators and all necessary minor appliances and utensils. Meals cost 35c. each. It is planned, however, to introduce a cafeteria service in connection with the regular meals, or perhaps to supersede regular meal service altogether.

Each camp mess hall receives daily supplies of meat, bakery products and ice from a central ice-making and cold storage plant and a bakery located at the Taylorsville Dam. Delivery is by motor truck. The bakery is equipped to turn out bread, pies and smaller bakery products in quantities necessary for the several camps. Meat in all the cuts and forms common in modern markets is prepared at the central meat shop both for the mess halls and on order from the cottages and the bunkhouse messes. The camp stores are also an important factor in the provisioning of the camps. Here canned and boxed provisions, cereals, flour, etc., besides

various household articles, are for sale. These stores are run by the district, which keeps the prices as low as market conditions permit.

War gardens are further aids in provisioning the camps. Several acres at each camp are divided into 30 x 100-ft. plots, and a plot is allotted to any cottager who will guarantee planting and cultivation. Seeds are furnished by the district. Next season, when the cottages are all occupied, it is expected that many backyard garden plots will be under cultivation. Many of the war garden plots planted this year are now showing good crops.

Provisions Made for Children

Outstanding among the services which the district renders to its construction camp tenants is free schooling for the children. There are from 30 to 50 children of school age at each camp. At four camps school houses are built; the fifth camp is near an existing school which will be attended by the children living there. Attempts will be made to introduce a measure of vocational training. It will be arranged so that some of the skilled artisans on the work will give the boys instruction in carpentry and perhaps other trades, and some of the cottagers' wives will teach the girls sewing and the simple lessons of domestic science. At Taylorsville the teacher will be a man who will also act as superintendent of all the schools. Women teachers will have charge at the other camps. It is hoped that school buildings and other buildings suitable for assemblies may serve as community centers, and that a spirit of interest and loyalty to the community and to the job may be developed.

Water-supply and sewerage are such commonplace requirements of modern construction camp operation that their provision at the camps of the Miami flood works scarcely deserves mention. Each camp has a driven well and deep well pump delivering to a tank on higher ground, whence distribution is by gravity to fire hydrants and to all buildings. The system of sewers with which all buildings are connected discharges into a combination septic and sedimentation tank and thence, where necessary, through a sand filter bed to an adjacent stream.

Camps Kept in Sanitary State

Camp sanitation is looked after by inspectors who see that rooms and bedding, sinks, closets, etc., particularly in the bunkhouses, are kept clean. Garbage is collected and disposed of in a sanitary manner. In fact, full measures of every necessary sort have been provided to preserve healthful living conditions. For the care of hurts received on the work there is at each camp a first-aid hospital, with competent attendance. A district physician and his aids watch after sickness and see that necessary medical attention is received in every case.

Credit for the high standards of construction camp practice is due to many. Chief among those who have given their thought to the work is Arthur E. Morgan, chief engineer. Mr. Morgan has made the camps in a manner his personal interest, and the results stand high to his credit.

Great Britain Is Building Concrete Ships

THE yards in which reinforced-concrete ships and barges are being built are multiplying in the British Isles. A recent issue of the *Times Engineering Supplement* states that in the west and south and on the northeast and northwest coasts of England, on the Clyde and Aberdeen in Scotland, and near Belfast in Ireland, yards are under way where some 220 vessels are in course of construction. These represent a total of about 200,000 tons of shipping and a capital outlay estimated at nearly £4,000,000, apart from the cost of the land and the shipyard plants. On the designs adopted the saving of steel is about 70,000 tons, as compared with the amount which would be required for steel ships of the same carrying capacity.

The British Admiralty gave every encouragement to the private firms which were undertaking this new industry. Following the announcement of Government aid, seventy or eighty ways were laid down immediately. On many places waste land and bare stretches of shore were rapidly converted into busy centers. Matters have advanced so far that at the present time several vessels of 1000 tons dead-weight carrying capacity are on the point of completion.

The vessels at present in course of construction for the Controller-General of Merchant Shipbuilding comprise barges of 1000 tons dead-weight carrying capacity and steam tugs of 750 hp. In addition, six cargo steamships of 1150 tons dead-weight are being built for private ownership, and designs have been prepared for steamships of much larger size, which it is understood will be constructed after the pressing needs of the Government for smaller craft have been sufficiently met. All the barges and steam tugs, 187½ ft. and 125 ft. in length, respectively, now under construction in controlled shipyards, are being built in accordance with the specifications and general drawings issued by the Admiralty Department of Merchant Shipbuilding. The details of the hull and of the reinforced-concrete construction are, however, in accordance with working drawings prepared by or for the various shipbuilding firms.

Most of the vessels are being molded on the monolithic principle embodying systems of reinforcement which have been used extensively for land structures. In some cases, however, the precast-slab method of hull building has been adopted, and novel systems of reinforcement have been designed. Again, in some instances, the bottom or the whole of the hull is being built on the cellular principle, while in others the hull consists of a single shell stiffened by transverse frames at frequent intervals.

Chloramine Holds Down Bacterial Count

Filtered water of the Denver Union Water Co., sterilized by hypochlorite of lime and plated immediately, showed seven bacteria per cubic centimeter on gelatine. When the water was plated again after being held in a bottle four days the count was 2600. Another filtered supply treated by chloramine showed counts of 14 immediately and 4 after four days' storage. This influence of chloramine on after-growths is most helpful in warm weather, says D. G. Thomas, chief engineer.

Puzzling Variations in Important Building-Law Clauses

Requirements as to Stresses—Specified Wall Thicknesses Often Wasteful—Wind Bracing Neglected—Interesting Special Features

By R. Fleming
American Bridge Company, New York City

STRIKING lack of uniformity in building codes regarding floor loads for the design of buildings, to which the writer called attention in *Engineering News-Record* of June 27, 1918, p. 1227, is paralleled by equally puzzling variations in other parts of such codes. These variations are more than merely puzzling, however; each requirement that departs from the normal, whether too loose or too rigid, may give rise to dangerous conditions.

The danger residing in loose or carelessly-drawn requirements is obvious; experience has amply demonstrated that they result in defective construction and frequently produce accidents. Excessively rigid requirements, on the other hand, hamper building construction and retard the growth of the city. For instance, provisions regarding structural steel may be so exacting as to put a premium upon non-fire-resistive building. When carried out such provisions waste money for the owner and do not benefit the city.

Some of the remarkable variations of building-code clauses will be here discussed. The writer's object is to illustrate the need for further efforts toward securing uniform and reasonable requirements.

Steel Stresses Frequently Not Up to Date

A dozen different column formulas for medium steel and more than twenty for cast iron may be found in city codes. The straight-line type predominates over the Rankine type. New York, Chicago and many others use $16{,}000—70l/r$ for steel, which may be considered the normal. The cumbersome and erratic formula of the Cleveland code is in a class by itself. A few codes contain nothing more than the meaningless general statement, "every column is to be of sufficient strength to bear safely its intended load." Others use the term "factor of safety," and others make the still more unsatisfactory statement that "standard modern authorities are to be followed."

Medium steel in almost all codes is allowed 16,000 lb. per sq.in. (net section) in tension and the same in bending stress on extreme fibers of rolled sections. Most codes also allow this unit stress in tension flanges of riveted girders, but a few restrict such girders to 15,000 lb., and some to 14,000 pounds.

Shop rivets in many codes are assigned a value of 10,000 lb. per sq.in. in shear and 20,000 lb. in bearing; good practice allows 12,000 lb. and 24,000 lb. and these values are being adopted in new codes. Shear in webs of plate girders is variously taken at 7000 lb. (Buffalo), 8000 lb., 9000 lb. and 10,000 lb. per in. of gross section; the latter value is largely used in present bridge and structural practice. Several codes of the smaller cities, though giving floor loads, make no mention of working stresses to be used in proportioning members.

The old New York code specified that brick enclosure walls between iron and steel columns, supported wholly or in part on iron or steel girders, must be not less than 12 in. thick in the upper 75 ft. of the height, and in each 60-ft. section below this, 4 in. thicker than in the section next above. This clause is now entirely obsolete, yet about 25 cities retain it, either in the original wording or with slight variation. For high buildings it places an unnecessary cost upon the owner because of the additional brick and steel required and the loss in rental due to lost floor space. There is no compensating gain in lateral stability, because the walls are cut up by windows where stability is most needed. Moreover, lateral and wind forces should be resisted by the steel frame. The engineer who designed the steelwork of the Hotel McAlpin, New York City, estimates that 800 tons of steel could have been saved had it not been for this foolish requirement.

The present New York code reads, "Masonry walls supported at each story by girders may be 12 in. thick for the entire height of the building." This practice is followed by 40 or 50 other cities.

Duluth and Portland (Ore.) specify, "Curtain walls supported at every floor level may be 1½ bricks thick for the uppermost 150 ft. and 2 bricks thick for the balance of the height down to the grade." Grand Rapids specifies that walls be not less than 10 in. thick. Davenport allows 9-in. walls when the panel does not exceed 16 ft. in width or 12 ft. in height; otherwise walls are to be 12 inches.

Lawrence, Milwaukee and Sioux City require only an 8-in. thickness. Providence allows the 8-in. thickness to be used for the upper 35 ft., Detroit and Flint for panels not more than 16 ft. in width and 12 ft. in height, Syracuse for walls not more than 15 ft. high between supporting girders, and Worcester for walls whose area between all supports does not exceed 300 square feet.

Fireproofing Around Exterior Columns.—The New York code reads, "Iron or steel columns placed within exterior walls shall be encased with approved masonry not less than 8 in. thick on outer and side surfaces and 4 in. on inner surfaces." The same requirements are given in 30 or 40 other codes. In addition to the 8-in. and 4-in. masonry, 8 or 10 codes call for a space of not less than 2 in. between the enclosing brickwork and the columns, to be filled solid with liquid cement grout as the courses of brick are laid. In contrast herewith, the Chicago code and 20 others call for 4 in. of brick on the outer face of exterior columns. San Francisco requires but 2¾ in. of fireproofing.

A demand of 8 in. seems unduly severe as a fireproofing requirement. If rain-protection is needed a provision for waterproofing can be inserted. Rain-protection is assured by the codes that call for liquid cement grout around the columns. There is no reason why a greater thickness should be needed on the outer than on the inner face of an exterior column. (The Poughkeepsie code requires 3 in. on the outer face and 4 in. on the inner

face of exterior columns.) Not only does 8 in. require additional material but it brings the columns 4 in. farther from the building line than would otherwise be necessary. This adds to eccentric loading from the spandrel beams, thus increasing the column sections.

A Proposed Specification for Wind-Bracing

In no other particular of building codes is there such wide variance as in the requirements concerning wind-bracing. A number of codes make no mention of the subject. In others the requirements are ambiguous. Boston and New Orleans simply say, "Provision for wind-bracing shall be made wherever it is necessary."

In a previous article, "Wind-Bracing Requirements in Municipal Building Codes" (*Engineering News*, Mar. 11, 1915), the writer dealt with the subject in detail. He now suggests for building codes the following section on wind pressure:

1. Wind shall be assumed blowing horizontally in any direction. The surface exposed to wind pressure shall be measured vertically from the ground to the top of the structure, including the roof.

2. All steel buildings belonging to the class known as "mill buildings" shall be designed to carry wind pressure to the ground by steel framework. For buildings not more than 25 ft. high to the eave line the wind pressure shall be assumed at not less than 15 lb. per sq.ft. on the sides and the corresponding normal component on the roof. For buildings more than 25 ft. to the eave line the wind pressure shall be assumed at not less than 15 lb. for the lower 25 ft. and 20 lb. on the side surface above 25 ft. and the corresponding normal component on the roof.

3. The steel framework of all buildings belonging to the class known as "office buildings" in which the height is more than 100 ft., or more than two times the minimum horizontal dimension, shall be designed to resist a wind pressure of not less than 20 lb. per sq.ft. on the sides and the corresponding normal component on the roof. Wind-bracing shall be provided by making the connection joints between girders and columns sufficient for the bending due to side pressure as well as for the vertical load; or diagonal bracing shall be placed between columns, proportioned to transfer the shear of the side pressure to the footings. Details shall be designed to carry the stresses in the main members.

4. When the overturning moment due to wind pressure exceeds 75% of the moment of stability the structure shall be securely anchored. The anchors shall be of sufficient strength to carry the excess overturning moment safely, without exceeding the allowable unit stresses given in this code.

5. When the stress due to the wind in any member or connection amounts to less than 50% of the total live- and dead-loads it may be neglected. When the stress due to the wind exceeds 50% of the stress due to the combined live- and dead-loads, all these stresses shall be added together and the allowable unit stress for the total may be taken at 50% in excess of the values stated elsewhere in this code. In no case shall the section be less than that required if wind forces be neglected.

6. Circular chimneys and water tanks shall be designed to resist a wind pressure of not less than 20 lb. per sq.ft. on the diametral area.

7. Sky-signs on tops of buildings shall be designed to withstand a wind pressure of not less than 30 lb. per sq.ft. of surface.

It may be noted that paragraphs 3, 4, 5 and 7 agree (except that "two" is used for "three" in par. 3, and 75 for 50 in par. 4) with the building code recommended by the National Board of Fire Underwriters.

How far should a building code enter the subject of structural steel detailing? Schneider, in summing up the discussion of his paper, "The Structural Design of Buildings," makes the statement that "Building laws have failed to protect the public from disasters caused by poor designs made by inexperienced men. They generally go too much into details, thereby assisting incompetent men to design the structural steelwork of buildings without a knowledge of mechanics, statics or even the first principles of designing." If the omission of details from building codes would keep incompetent men from attempting to design there would be much to be said in its favor. But the writer has not found this to be the case. Incompetent designers are unhampered by rules in accordance as they are *not* stated in the building code. Moreover, a great many questions of detail must be settled by somebody and if the code can decide such questions why not have it do so?

Many Questions Arise Concerning Steel Detailing

The plate girder is a fruitful theme of regulation. Why should a building code prescribe whether its strength shall be calculated by moment of inertia or by flange area, when either method is perfectly legitimate? But it may properly specify the limiting ratio of web-thickness and of unsupported flange width. The stiffeners might well be located by the code. Incidentally, the writer would suggest that the requirement in the New York and other codes for web thickness not less than 1/120 of the unsupported distance between the flanges ought to be revised by changing the ratio to 1/160, as given in most codes.

It is hardly to be expected that building codes should agree regarding the unsupported width of compression flanges of rolled beams when even the steel manufacturers' handbooks differ widely on this subject. The writer recommends that where the unsupported length is more than 12 times the width of the compression flange the unit stress in bending shall not exceed $19{,}000 - 250\,l\,b$, where l is length of span and b is width of flange, both in inches. The Newton, Mass., code specifies, "Separators shall not be considered as rendering the flange of a beam supported," a caution often necessary though perhaps not always applicable.

The familiar phrase, "No part of a steel column shall be less than $\frac{1}{4}$ in. thick" is in an occasional code found to be modified by having "$\frac{1}{4}$ in." changed to "$\frac{5}{16}$ in." or "$\frac{3}{8}$ in." This change is clearly unwise. The upper-story columns generally support only the roof, and for this light load even the $\frac{1}{4}$ in. minimum often gives an excess of metal. The more general clause found in some codes, "No metal shall be less than $\frac{1}{4}$ in. in thickness," if taken literally would exclude the light weights of all channels under 12 in. The clause is almost never applied in this way, but for the sake of clearness, if it is not the intention of the compiler to throw out the lighter rolled shapes, the words "except in webs of rolled beams and channels" should be added.

Comment on Special Clauses of Building Codes

Unless a code is slavishly copied in every particular from other codes, the personal equation of the compiler will at times show itself in the form of special requirements. For this reason the structural engineer should read carefully any building code or regulation that affects the design of his building. Tabulations and abstracts are not sufficient. A few special requirements will be given, though they all do not originate in the particular codes from which they are quoted.

Auburn (N. Y.) specifies, "The slope of composition

roofs shall not exceed two inches to the foot." This was probably written after observing how a heavy rain caused composition roofing to wash from a roof. However, 2-in. pitch is rather steep for ordinary tar and gravel, and on the other hand there is composition roofing material that can be laid on 3- or 4-in. pitch.

Baltimore—"The working section of beams, columns or other important members shall not be cut or punched by other contractors without the approval of the inspector of buildings." It would be interesting to know how this requirement is enforced.

Cleveland—"The latticing of compression members shall be proportioned to resist a shearing stress equal to 2% of the direct stress in the members." This provision, an echo of the discussion following the Quebec Bridge disaster of 1907, might well be adopted in other cities.

Des Moines—A commendable premium is put on fire-resistive construction by the clause: "All buildings of fireproof construction shall be exempted from 20% of their value for assessment purposes for a period of five years after the erection thereof." This clause is recent, being an amendment adopted Jan. 5, 1917.

Erie—"Every panel in a curtain wall shall be proportioned to resist a wind pressure of 30 lb. per sq.ft." This sentence is found in several codes. How shall the calculation for strength be made?

Grand Rapids—Instead of a quotation being given an omission will be noted; the Grand Rapids code makes no mention of cast-iron columns. The wisdom of this is doubtful. The use of cast-iron columns may be restricted or prohibited but should not be ignored.

Oakland—"Where columns have milled end bearing the splice shall be of sufficient strength to take at least 30% of the column load." This is impracticable, or nearly so, for heavy loads. Column splices should be designed to hold the column securely in place and to take bending stresses due to the wind. It is also well to have direct loads of less than 40,000 lb. transmitted through the splice plates. But a general requirement such as quoted is not necessary.

Spokane—"The main idea, however, shall be preserved, i.e., about one-half the columns should be spliced at every second floor and the remainder at the adjacent floors." A similar provision is in the Oakland code. Such a requirement is very annoying to the detailer, the fabricating plant and the erector. The object is to secure stiffness, but this can be obtained by proper splices.

South Bend—"When loadings on steel, wrought-iron or cast-iron columns are eccentric the column areas shall be increased in accordance with the following formula: $A' = \frac{Pdx}{Sr^2}$." This is an interesting example of how a code can trespass upon the province of the textbook. Moreover, the Rankine formula does not apply to all cases of eccentric loading.

Terre Haute—"Structural members carrying elevators and elevator machinery shall be proportioned to carry twice the actual moving dead or live loads." Such extra provision of strength should be made by the structural engineer whether specified in the code or not.

Washington—Under the head of bolting structural steel and wrought-iron members the Washington code says: "When bolts are used for suspenders, the working stresses shall be reduced for wrought iron to 10,000 lb. per sq.in. and for steel to 14,000 lb. per sq.in." These values, found in 30 or 40 other codes, are entirely too high. They were taken by most compilers from the New York code that was in force from the '90s until 1915. The New York code now in force assigns a value of 9000 lb. to steel bolts in tension and makes no mention of wrought iron; the writer uses this value in his own specifications and adds a clause:

> "In cases where it is necessary to carry loads subject to shock by bolts in tension, check nuts shall be used. When bolts go through bevel flanges, bevel washers to match shall be used so that head and nut are parallel. In general rivets and bolts in tension shall be avoided as far as practicable."

Newark—A noteworthy special requirement, also found in the codes of Atlanta, Paterson, and several other cities, provides that the floors and roofs of fire-resistive buildings "shall be constructed with rolled wrought-iron or steel floor beams, spaced not more than 5 ft. on centers for stores, warehouses and factory buildings, and for all other buildings not more than 8 ft. on centers." This provision eliminates so-called long-span construction. For cities with well-organized and competent building departments it is an unjust discrimination, but for cities where little or no engineering supervision is exercised over building construction it gives a needed "factor of safety."

Damages for Illness Caused by Polluted Water on Steamer

Damages totaling $50,462 on account of typhoid and other sickness alleged to have been caused by drinking polluted water on the lake steamer "South America," sailing from Detroit, have been awarded to eleven plaintiffs. The damages were fixed by William S. Sayres, Jr., standing master in chancery, Detroit, Mich., after decision in favor of the plaintiffs had been rendered by Arthur J. Tuttle, judge of the United States District Court. Other claims are pending. An appeal has been taken to the Federal Circuit Court of Appeals. In his decision Judge Tuttle held that the evidence submitted proves beyond question that the typhoid cases were contracted while on the trip already mentioned. He referred the question of damages to the master in chancery.

It is alleged in the claims that after the steamer was 13 hours out from Detroit it stranded in the Hay Lake channel of the Sault Ste. Marie River, and that after using up the water in the tanks aboard impure water from the river was supplied for drinking purposes. The awards range from $16,045 to $305, some of the alleged victims having suffered from complications or sequelae, and damages being granted to some for loss of time. The highest award was to Charles P. Moore, as follows: For gallstones, $1500; pain and anguish, $2000; medical expenses, including trip for recuperation, $1546; business loss from June 15 to Dec. 15, $7500; business impairment after return, $3500. To W. A. Malotte the award ran as follows: Medical attendance, $721; pain and anguish and impaired health during sickness and in future, $4000; business loss $7000; total $11,721. The award of $306 was for doctors' bills, nurse and drugs for the infant daughter of Frank J. Campbell.

Broader Foundation Demanded for Engineering Education

Higher Aims Also Needed — Students' Longings Not Met — Vision of Great Practitioners Should Guide Educators

By Frederic Bass
Professor of Municipal and Sanitary Engineering, University of Minnesota

AN EDUCATED man is one who has developed his soul, mind and body harmoniously and fully, with the purpose of doing his work in the world as well as his nature permits. He is a man who is always growing, even to his death; who recognizes his limitations and seeks constantly to surmount them, that he may realize the freedom which is the birthright of all humanity.

If this definition is a true one, the educated engineer has work to do which should become one of the greater factors in the progressive social program now appearing in Western civilization. He is not necessarily limited to perfecting himself in the details of technical accomplishment, important as that may be. He is limited only by his conception of the relations which he and his profession bear to other human groups as to position and functions.

Engineering practice is in reality a part of industry and government; it is concerned with capital and labor, with the methods of commerce and business and with human material and forces as much as with inanimate materials and their reactions to physical forces.

In the formal education of engineers it has been assumed that engineering is founded upon the application of physical law, and that mathematical ability is its most important manifestation. This assumption has until recently been unquestioned among educators, while practicing engineers have long since rejected it. Practicing engineers who have risen to heights of professional attainment often have never received formal education in the schools; the "University of Hard Knocks" has been their source of wisdom. But whether practicing engineers hold degrees or not, they have not formulated their ideas of education of engineers in a manner which has made possible any considerable headway against academic tradition.

Educators Overburdened by Routine

Many engineering educators have been for years overburdened by routine, so poorly paid that they could not avail themselves of opportunities of observation by travel, and engaging in private practice only under unfavorable conditions. Detail has clouded their vision and warped their perspective. Social demands have conflicted with inadequate compensation, and the general environment has not been such as to establish in the schools that peculiar type of leadership which, remaining in touch with existing conditions and tendencies, yet has a comprehensive, penetrating and rational vision and definite plan for the future. That educators have not taken hold vigorously of the academic problem has been due partly to the lack of systematic supervision and coordination of departments. It is in the nature of teaching and research that the teacher should be allowed to follow his individual tendencies more than in a commercial organization, but that does not offer an adequate excuse for the prevailing exclusiveness of university departments.

School men are now conscious of some of the defects of engineering education and of the difficulties in removing them. The usual engineering school curriculum in its early years includes instruction in mathematics, drawing, chemistry, physics, shop work or surveying, rhetoric and language. The student is given instruction in these subjects by different departments which, jealously guarding their integrity in the school organization, often hold rigid ideas as to the content of their courses, irrespective of equally unyielding ideas in other departments. The teachers of engineering students in the first two years of the course are rarely men of experience in engineering practice, and almost never men of extended experience; their affiliations are academic and their methods colored accordingly. They live in an intellectual region far removed from that which the men whom they teach will occupy in their life work.

If the Student Could Do It Over Again

The junior student reviews and applies the mathematics and physics of his earlier years and is introduced to courses in elementary design; he then gets the first taste of the food for which he has hungered, and often it has not the attractiveness that it had in anticipation, before the edges of youthful enthusiasm had been dulled by formal routine. An athlete who trains too long without the stimulus of a real game becomes "stale"; he has possibilities which may be developed by discipline but which may be atrophied by an overdose of the same medicine.

When the student reaches his senior year he may indulge his intellectual powers without limit in the interesting problems which are given to him to solve, through the use of his previous training and his originality. He finds at the end that if only he had it to do over again he would have many things otherwise.

After graduation he goes into the busy world and begins his education by his own efforts. Usually he has never known just why he was taught as he was, and he vaguely wonders why it could not have been different, but is content to allow that to remain a mystery since new problems force themselves upon his attention.

So the army of technical students goes on. There has not been time to place before them in their school life the many social and economic foundations upon which the superstructure of engineering has been reared, and the foundations now being constructed which will determine the engineering of the future. All educators recoil with horror at the suggestion of superficial instruction, yet many engineering educators have failed even to recognize the nature of engineering practice—that it is essentially a superstructure, built not upon a foundation of mathematics but upon political economy. That is why the engineer so often asserts that much of his time in the technical school was wasted. He was provided with the superstructure, but when he came to deal with the real problems of practice he found that it was built in the wrong place and he had to build another, as well as an extension of the foundation.

Engineering education must be very considerably modified, and that soon, if engineers are to begin their

careers with the outlook upon life which will embrace their future, guide it through the period of technical preparation which will form their early experience, and on to that later one in which their work will deal with the greater affairs of government, finance, industry and business, largely dependent upon engineering skill and method. Engineers may confidently look forward to the time when it shall be the ordinary thing for them to occupy the posts of railroad presidents, industrial manager, city manager and high political office, provided that the foundation on which they build is designed to support that future.

Still another feature of engineering education is that of contact with practice during the school training. Aristotle taught that the best way to learn anything well that had to be done after it was learned was to be doing it while learning it.

Engineers have long analyzed physical forces and then distributed the materials of construction so that these forces might be most economically countered. This same problem must in practice confront the engineer on the human side. Modern psychological methods of determining the vocational aptitudes of men have been developed to such a point that the present or future employer of men cannot afford to remain neglectful of them, choosing his subordinates and helpers by rule of thumb as engineers chose materials when engineering was an art more than a science. Scientific engineering of the future must include the scientific analysis of human nature, so far as that is possible.

Must Foster Interest In Studies

What is necessary? First, the interest, already formed, of all the entering engineering students must be fostered rather than suffered to die or atrophy. This does not involve the excitement of the student by shallow wonder at the marvels of engineering accomplishment, but it does mean the presentation of typical engineering works to the attention of the beginning student, with an analysis which will enable him to grasp the real play of forces active in every structure and piece of machinery of man's making, and to express the meaning of their action in the beautiful shorthand of mathematical language. The study of physics may also be introduced in this same way. It is more than a suspicion that lines and forces in bare diagrams and the accompanying mathematical expressions may be transformed from objects of insipid attention to problems compelling the liveliest interest by taking them from examples in actual existence. Mechanics and strength of materials may then be introduced simultaneously with mathematics and drawing, and the practice of engineering as it really is, with all of its larger problems of economics, may be provided for in the later years of the course.

So the engineering schools need guidance by the vision of the great practitioners, the resolution to bend college procedure into a form adaptable to the changes in practice, and the introduction of examples from modern practice into the early years. Thereby time may be economized, and the introduction of human studies into the later design and management courses made possible. When this has been done the various engineering collegiate departments may feel that wave which is now sweeping through the active engineering professions, carrying the message of unity and portending an era of high accomplishment for all engineers. But the main problem is to devise a campaign under the proper auspices, based on careful analysis of observed conditions prevalent in the various schools of engineering, in the light of the statements already made herein. It should be so conducted as to enlist the interest of the great practitioners in the rising generation of engineers and in their proper and adequate training. More than this, the attention of university and college presidents and boards of trustees and regents must be drawn to the need for coördination of departments, correlation of courses and sufficient financial support, without which no results may be expected. Presidents and governing boards will listen carefully to a well considered program, carefully arranged and forcibly presented by the leaders of a profession whose main object is to contribute its service to the cause of a higher civilization.

Spring Valley Water Company to Charge Meter Rates

A NEW schedule of rates based on metered service was put into effect in San Francisco Sept. 5 by the Spring Valley Water Co. Authority for this action was given by the State Railroad Commission upon the request of the company. The new rates require the payment of a service charge from 65c. a month for each ¾-in. meter to $40 a month for 8-in. meters.

The charge for the water delivered is fixed at 24c. per 100 cu.ft. up to 3300 cu.ft., 21c. up to 33,300 cu.ft., and 18c. per 100 cu.ft. for all above 33,300 cu.ft.

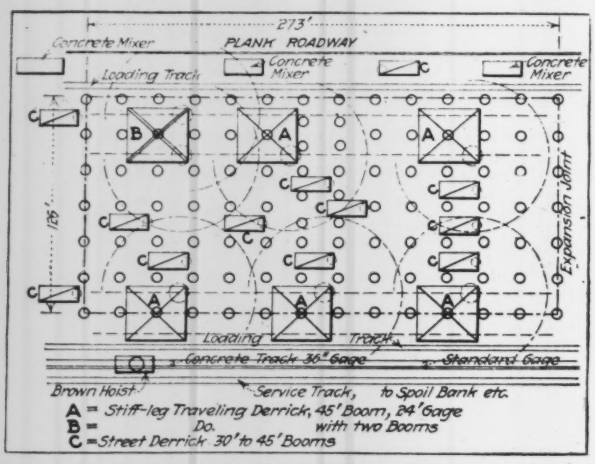
The new schedule established by the commission is a compromise between that proposed by Allen Hazen, the company's water expert, and R. W. Hawley, hydraulic engineer for the commission, and is designed to provide a gross income of $3,632,252, the return earned by the company in 1917. The rates are tentative and are expected to maintain an equilibrium between the amount of revenue that would be produced by the flat-rate system and that produced by meter charges. Should there be an excess produced by the meter rates, the amount is to be impounded and retained subject to the orders of the railroad commission. The purpose is not to increase the gross revenue of the company but to maintain it regardless of the change to measured service.

Approximately 90% of the domestic consumption of the company has been metered, but the meters have been used only to check excess use and as a basis for computing meter rates. The primary purpose in charging for water on a metered basis at this time is to conserve water and to put the cost of waste—the burden, in other words—upon those who are wasteful. The subnormal water-supply for the past two years has brought about an immediate necessity for conservation, and the possibility of a third year of shortage brings the water consumers of the city face to face with an emergency. The necessity for conservation is shown in the statistics of the rainfall compared with the normal rainfall, for the past five years: 1912-13, 109%; 1913-14, 112%; 1914-15, 102%; 1915-16, 71%; 1916-17, 41%. The normal rainfall is taken as the average per season for the past 40 years.

Sinking Six Cylinder Foundations a Day On Boston Army Supply Base

Concrete Open Wells of 6-Foot Outside Diameter and From 33 to 55 Feet Deep—Careful Planning and Profusion of Handling Machinery Permit Placing of Nearly Six Hundred in Less Than Three Months

CYLINDER piers, sunk as 6-ft. open wells to a maximum depth of 55 ft. and filled with concrete, form the footings of the 126 x 1638-ft. main storehouse of the new Boston Army supply base. Five hundred and seventy-seven of these piers were required, and the officers of the Construction Division of the Army, driven by the necessity of having the entire base ready by the new year, allowed in their schedule 133 days for this foundation work. Starting Apr. 22, just eight days



ONE OF THE SIX SIMILAR SECTIONS, SHOWING LAYOUT OF CYLINDERS AND HANDLING MACHINERY

after they were notified that they were to take the contract, P. McGovern & Co., contractors of New York and Boston, turned over the cylinder pier foundations complete Aug. 10—that is, 20 days ahead of schedule and in an elapsed time of 110 days—making an average of 5.34 footings per 24-hour working day, deducting eight days—holidays, Sundays and rainy days—when no work was done. The Government schedule called for a progress of 5.51 per day after the first month, or an average of 4.33 per day.

Planning the work ahead so that the successive steps in the construction operations could proceed smoothly, and providing enough construction equipment so that no operation would be stopped for lack of machinery to go ahead with it, were largely responsible for the good speed made. Planning was complicated by the narrowness of the area of operations and by the unavoidable congestion forced by the close spacing of the holes and the restriction to the plot itself of practically all of the equipment. Roads and railroads on both sides of the 126-ft. area could not be trespassed upon because they were necessary for the construction operations going on over the whole supply base area. Furthermore, the machinery and equipment used were limited by the inability to procure more in the market. With more derricks available, for instance, the contractor feels that he could have made better progress.

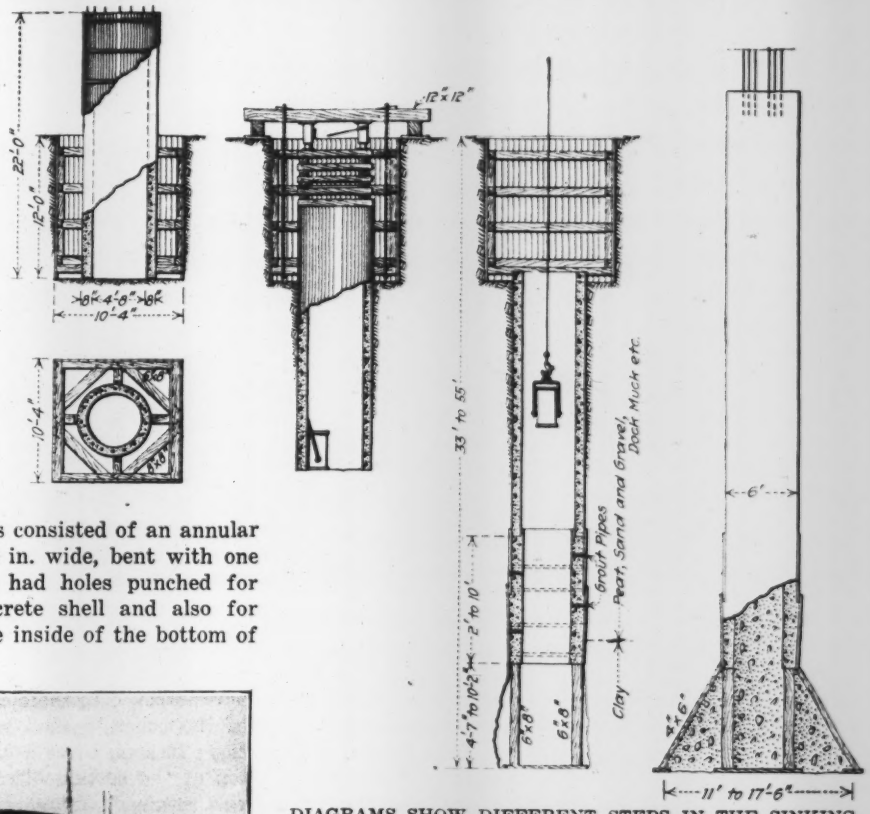
The main storehouse is made up of six sections, each 126 ft. wide and 273 ft. long, forming a continuous structure 1638 ft. long. The columns foot on concrete cylinder piers, spaced 21 ft. c. to c. in both directions. The line of piers at the section joints carries the columns from each of the adjoining sections with an expansion joint between. Each cylinder pier is 6 ft. in diameter and bells out at the bottom to a circle from 11 to 17½ ft. in diameter, depending upon loading, a safe bearing value of 4½ tons per square foot being assumed for the clay in which the cylinders were finally brought to bear. The material penetrated varied considerably even from hole to hole, but consisted mainly of cinders and rubbish fill for a top layer, hydraulic fill of silt, sand and gravel, to peat, and finally to clay, in which the footing stopped.

The construction routine for each cylinder pier was the same. In brief, it consisted of the construction of a hollow concrete shell 6 ft. outside diameter, 8-in. wall thickness and 22 ft. high, in a 10 x 10-ft. pit 12 ft. deep. This shell was then jacked down, excavation going on inside, as far as it would go. The remaining depth to hard bottom was gained by the construction in place of a similar shell below the bottom of the precast shell, and the subsequent belling out by open excavation beneath the concrete shell so formed. Finally, the whole shaft was filled with concrete to the floor level, with heavy dowel rods set in its top.

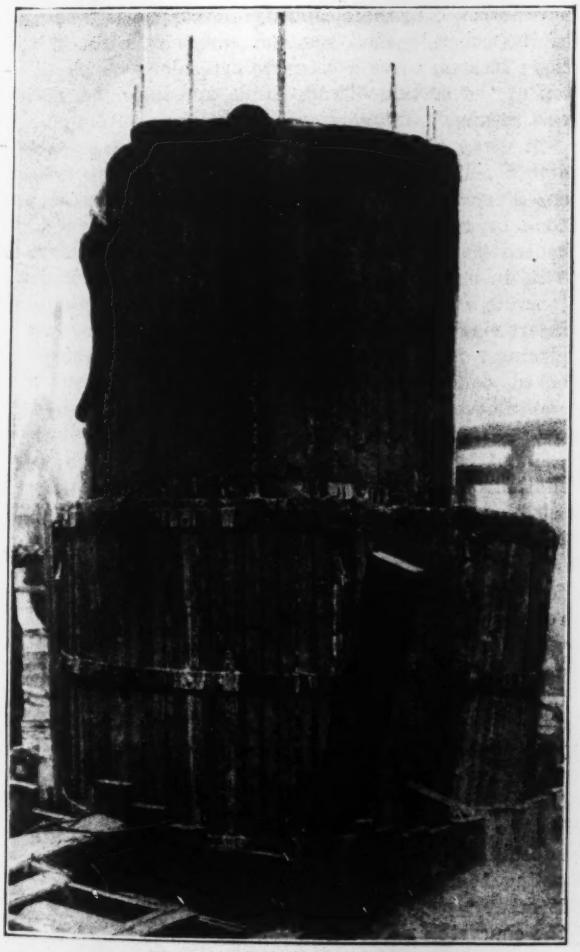
One of the sketches shows the progressive construction of a cylinder pier. The primary excavation was made in a hole from 10 to 12 ft. in depth and 10 ft. 4 in. square, using 2 x 8-in. x 12-ft. rough spruce sheet-

LOOKING ALONG THE FOUNDATION WORK AT THE HEIGHT OF PROGRESS. TWO-BOOM DERRICK CONTROLS CYLINDERS UNDER CONSTRUCTION

ing and 6 x 8-in. braces spaced vertically about 2½ ft. In this hole were set up the forms for the precast shell on top of a circular steel cutting edge. Two forms of cutting edge were tried. In the beginning of the work a heavy structural steel edge was made up of one plate ⅜ x 8 in. and one angle 3 x ⅜ in. This was laid out in three lengths and was designed for removal and reassembling for repeated use. It was found, however, that it was extremely difficult to remove these edges, and a cheaper cutting edge, to be left in place, was devised. This consisted of an annular steel plate $\frac{3}{16}$ in. thick and 12 in. wide, bent with one edge down. The flat section had holes punched for anchoring it fast to the concrete shell and also for fastening a wooden ring on the inside of the bottom of the concrete form. The structural steel edges cost about $41 apiece. The steel plates cost about $23.



DIAGRAMS SHOW DIFFERENT STEPS IN THE SINKING OF THE CYLINDER PIERS

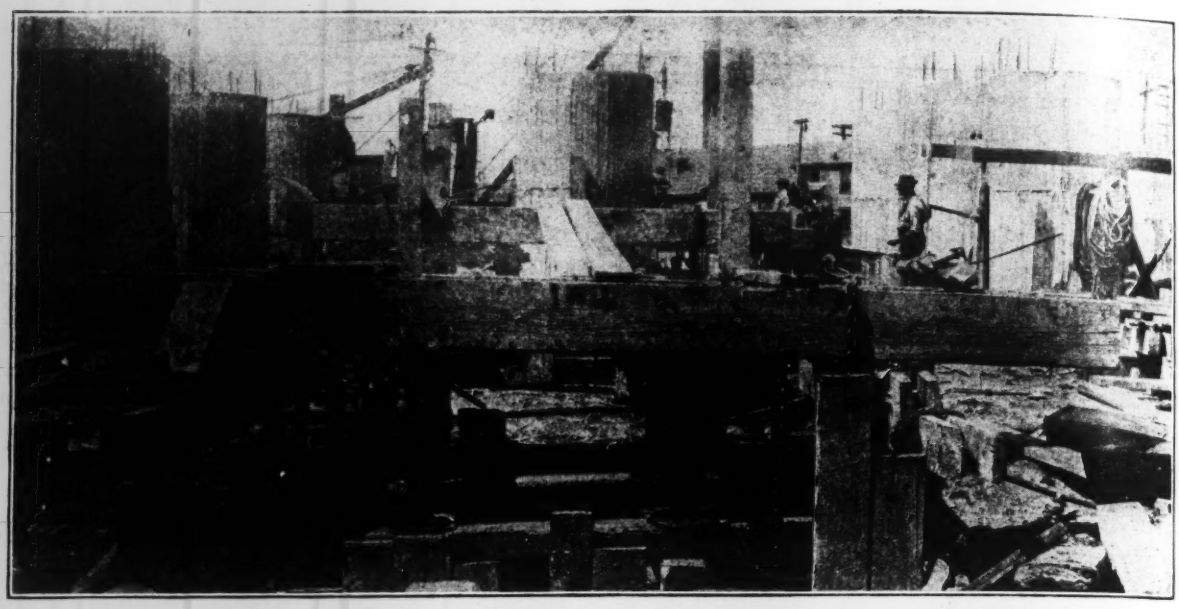


FORMS FOR PRECAST HOLLOW CYLINDERS OF VERTICAL WOOD STRIPS BOLTED TO IRON BANDS

The concrete forms in which the cylinder sections were cast consisted of radially sawed strips of wood bolted in vertical rows to ⅜ x 3-in. iron rings, which gave the form sufficient stiffness. The same type of form was used for both inside and outside. It was built in three sections, for ease in erection and removing. Enough forms were provided for 30 complete 22-ft. sections and a number of shorter sections. These forms stood up very well in the work but required considerable repair in the shop. The contractor is of the opinion that if there had been time to prepare metal forms they would have proved cheaper and more expeditious in the long run.

As soon as the forms were placed the concrete was poured to form the shell. The forms were stripped in about 24 hours and the excavation was started. It was carried on by two men, working inside the cylinder, who emptied the spoil into small "coffee pot" buckets 18 in. in diameter and 30 in. high.

Usually the concrete shell sank by its own weight about 10 ft. into the ground so that the top of the 22-ft. bell was about level with the original ground surface. At this point jacking was started by placing two 12 x 12-in. timbers across the top of the cylinder and building up cribwork of similar timbers. These timbers were fastened with ⅜-in. log chains to the bottom of the sheeting of the pit, using 8 x 8-in. timbers across the corners under the lower waling piece. Two or four jacks with a capacity from 15 to 40 tons, according to the situation, were then placed on top of the



IN FOREGROUND, JACKS ARE PLACED BEFORE OPERATION TO PUSH CYLINDER PIERS INTO THE GROUND

concrete shell and under the 12 x 12-in. timbers, and the jacking down of the cylinders began, the excavation being removed as the jacking continued.

This operation was continued until the length of the cylinder was reached or the resistance of the sheeted bulkhead overcome—that is, until the sheeting as a whole began to pull out of the ground. This point was termed the "jacking limit." The force exerted by these jacks was estimated to be from 100 to 125 tons, although this is only problematical, as the 40-ton jacks never worked to their capacity. Many times the length of the concrete shell was not sufficient to reach solid clay; in such cases a concrete extension was placed on top of the section already sunk, and later the jacking was resumed.

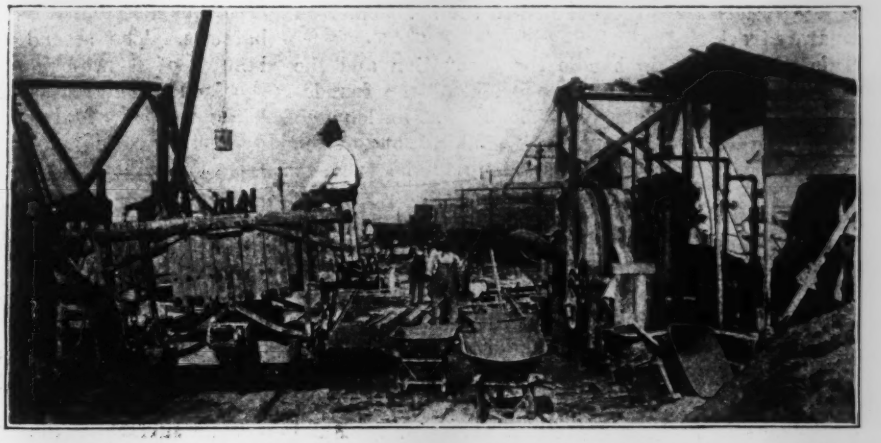
WAGON DERRICK LIFTS COFFEE-POT BUCKET FROM CYLINDER PIER DURING EXCAVATION

In many of the piers the jacking limit was reached before solid clay was encountered, so that it became necessary to place an extension on the bottom. This was done by continuing the concrete shell in an open cut behind poling boards. These boards varied from 1 to 5 ft. in length, the upper end being placed behind the concrete shell and the lower end held out by flat steel insert rings ⅜ x 3 in., built in three sections, for ease in placing. Sometimes it was necessary to use pieces of board, oakum and even hay to keep out the soft mud and silt while the concrete was being placed. After the poling boards were in place a form 4 ft. in diameter was put in the bottom of the hole, extending 1 ft. above the bottom of the concrete fill. This was then poured with a 1:1½:3 concrete through the 4-in. annular opening between the inside of the shell and the form.

A wooden lid or cover was used as a landing platform for the concrete, which was dumped from wheelbarrows into vertical metal chutes. Sand to a depth of 1 ft. was placed in the bottom of the hole to prevent the concrete from being forced into the working space. After the forms had been moved from this section holes were drilled through the concrete shell and grout pipes placed. Later the space behind the concrete and around the board was filled with cement grout which shut out the water from passing into the working chamber. Owing to the presence of soft mud, sand and gravel encountered in various holes, it was difficult to set the poling boards and shut out the water, so that at times it became necessary to make two operations of placing the concrete and the grouting.

After the concrete shell had been either jacked down or extended into solid clay, the belling operation was

started by digging down vertically a hole about the diameter of the concrete shell. Temporary props were used to hold up the shell while the excavation was being made. At the required depth three 6 x 8-in. permanent props were placed with foot blocks to distribute the load on the clay. After the props were in the bell the hole was excavated in sections and 4 x 6-in. lagging placed as close as was needed to hold up the sides of the bell until the hole was an acceptable size. In certain holes, when the clay was softer, the props were strained to a breaking point and had to be increased in number and size, while 6 x 8-in. lagging was used. Even extra bracing was not sufficient to prevent the clay from squeezing up into the floor and in between the lagging so that it worked into the bell hole about as fast as it could be removed. In one instance the settlement was so great that the surface of the ground sank about 3 ft. and adjoining completed piers settled vertically about 2½ in. and shifted out of line about 5 or 6 inches.



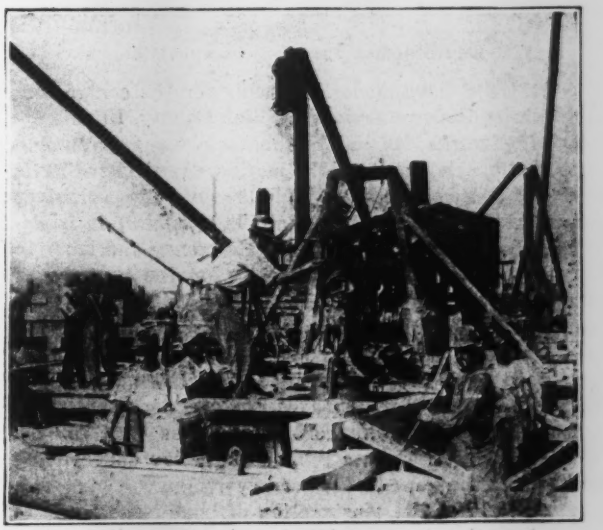
ALONG ONE SIDE OF FOUNDATION AREA. AT RIGHT, ONE OF THE SMALL CONCRETE MIXING PLANTS. AT LEFT, THE CYLINDER FOUNDATION WORK

Ground water caused great difficulty in the pier work. It was encountered almost from the surface of the ground, and pumps had to be constantly used until the cylinder was the regular distance down. Hand and gasoline diaphragm pumps were used within pumping limits and below this steam ejectors proved very practicable. All the water from the pumps was carried off by square wooden troughs laid out in gridiron fashion over the whole warehouse area.

It will be seen that the speed of the cylinder sinking is dependent on the coefficients of friction between the cylinders and the earth, and between the sheeting of the pit and the earth. As worked out on this job, a depth of 12 ft. of sheeting required about 22 ft. of concrete cylinder to balance it—that is, as a rule the 22-ft. cylinder could be sunk about to the bottom of the pit before the uplift began to move the sheeting. A deeper pit would have permitted the use of a longer precast cylinder, and would in some cases have avoided the extra cast-in-place concrete in the lower section of the cylinder. However, it was estimated beforehand that the average depth of the holes would be about 33 ft. and the cylinder forms were fixed on that basis; the average depth turned out to be 43 feet.

Pit excavation was practically all hand work, assisted by some gin poles and hand derricks. It proceeded well ahead of all the other work—so far ahead that there could be assurance that the pit would be ready for the cylinder operations in plenty of time. Both excavation and concreting were controlled by a group of derricks consisting of six large derricks and 14 small street derricks. The large derricks were of the stiff-leg platform type, traveling on a 21-ft. gage track. These tracks run along either side of the lot, two derricks with their 45-ft. booms covering the entire width of 126 ft. One of the six was provided with a boom at each corner, giving a somewhat larger radius of action. Had fittings been procurable all would have been so equipped.

Owing to the fact that these large derricks could handle material for a maximum of but three holes at a time, the groups of street derricks were provided. These consisted of an ordinary hoisting engine and A-frame derrick mounted on heavy truck wheels. The booms ranged from 25 to 40 ft. in length, and some were equipped with bull wheels. The smaller derricks were spotted all over the foundation area, taking care of holes wherever the large derricks could not reach or which were beyond their capacity to handle.



ONE OF THE SMALL WAGON DERRICKS LIFTING DIRT FROM CYLINDER BEING JACKED DOWN BY FOUR MEN

Narrow-gage tracks were laid down along both sides and the end of the lot to carry dump cars of 4-cu.yd. capacity pulled by a dinkey engine. These cars were spotted opposite each of the traveling derricks and replaced by others when filled with excavated material.

The loaded cars were then hauled to the spoil bank on a separate track.

This whole outfit to handle the excavation and the concreting moved ahead from one end of the foundations to the other. Wherever difficulty was anticipated or met in preliminary excavation far ahead, one of the smaller derricks was readily moved up to the work to speed it up so that the whole could be ready for the concreting operations and would not retard the surrounding construction. The main difficulty in planning the layout of these derricks was to move them ahead in such order as not to cover up any adjoining hole which was under construction. Each derrick, wheel or traveling, attended a maximum of three holes at a time.

Concrete for the piers was mixed in two separate plants. The first was a permanent plant equipped with a three-bag mixer with storage bins above for sand and gravel. This plant was located on the site at the Government sand and gravel dock, to which sand and gravel were supplied direct from barges or from storage piles at the side. Cement was hauled by flat-cars and dinkey locomotives from the Government storehouse on the site. Concrete trains, of two flat-cars, were hauled to movable distribution hoppers stationed alongside of the foundation area. From there the concrete was distributed to the various holes by steel wheelbarrows. The second concrete plant consisted of a battery of 3 two-bag steam-driven mixers, located in the foundation area alongside of the service road paralleling the lot. Material was supplied to these plants by motor truck, and the concrete was wheeled direct from the mixers to the holes.

The maximum number of holes completed in 24 hours was 17 on July 27, twelve being in one section and five in another. Other record days were one of 16 holes, three of 14 holes and four of 12 holes each. The labor employed made up a daily average of 1106 men working 11 hours per day for a period of 112 days. Two shifts of 11 hours each were carried. The total quantity of excavation was 50,143 cu.yd., or about 87 cu.yd. per hole, this being the quantity computed from the original ground surface to the bottom of the bell hole and not including the rehandling, which was considerable.

The Boston Army supply base is being built by the Construction Division of the Army under the direction of Brig. Gen. R. C. Marshall, Jr. Maj. C. R. Gow is constructing quartermaster in charge of the work. For P. McGovern & Co. Andrew A. Cohill, chief engineer of the company, was in immediate charge of the work, with George I. Oakley as supervising engineer.

Illinois Farmers Aid Contractors in Finishing Road Work

Appreciation of Good Roads Leads to Provision of Means for Completing Jobs Checked by War Conditions

By P. C. McArdle
Superintending Engineer, Danville, Ill.

FARMERS have made it possible for the contractors to finish their roads in Vermilion County, Illinois, by supplying teams for hauling materials and gathering subscriptions to complete the work without charging it against the construction. While work by volunteer labor on the roads of the state is not new, it is decidedly new for the public to donate money and labor to a contractor or bonding company for the purpose of completing contracts. It seems to indicate that the experience of the past year or two, in driving over the roads already built, has convinced the most skeptical that good roads are a necessity in these war times, and that, while they pay in taxes for the contracts, they are willing to pay still more rather than wait for the roads until after the war. Thus they are endeavoring to close up the gaps in the road system.

Contracts for the construction of bond-issue roads in Vermilion County were let Apr. 7, 1916. Work was started on practically all the nine divisions about the middle of May, but as time went on prices of labor and materials began to rise. Progress on the nine divisions in 1916 averaged only 5.6 miles per contract, which was reduced to 4.4 miles in 1917. After war was declared men were withdrawn from industry still more rapidly. The car-service order and priority order which went into effect Apr. 26 and Oct. 28, 1917, respectively, stopped work for at least two of the best working months of the year and resulted in the production of only 92.43 miles of road, out of a total of 166 miles under contract to be completed by November, 1917.

County officials, being aware of the added costs of labor and materials, hesitated to enforce the forfeiture and penalties clauses of the contracts and relet the work, because of the defense which might be raised that the war automatically prevented their successful execution. All were notified, however, that the county expected them to complete the work at the earliest possible moment.

Only two contracts were started in the spring of 1918, and investigation proved that, by more or less concerted action, the contractors and bondsmen for the others had determined not to proceed. After the railroads had been taken over by the Government the higher freight rates and rigorous rules regarding switch tracks and freight movements further complicated matters, and as a result the two remaining contractors withdrew from their work.

Appeals of citizens, deeply interested as abutting property owners and moved by other considerations, offered inducements to the contractors to take up the work again. On division 6 committees were formed in each of four small towns through which the road passed, and in a short time had obtained guarantees of sufficient free teams to haul all of the material for 5½ miles of road. Work is progressing very well under this arrangement. Two outfits, working at opposite ends of the job, are each making about 400 ft. per day.

On division 8, without any such committees, but at the request of prominent farmers, sufficient teams were obtained to move the camp and equipment 11 miles. Farmers also agreed that if the contractor would provide the shoulder material at the siding they would haul it to the job free of charge, provided he would place the concrete slab. It is proposed to carry out this second part of the agreement after the concrete slab is completed.

Work on this job is progressing perhaps as well as in the previous two years. The county agreed to furnish the services of its division engineer as superintendent, thus relieving the contractor of the cost of his highest paid employee and reducing his overhead expense.

As a result of these two examples, farmers in other sections of the county are gathering the necessary subscriptions to get work started before the end of this working season, and it seems probable that the balance of the work may be completed in this way, if further war exigencies do not prevent such completion.

Drivers and Garage Clerks Keep Contractor's Motor Truck Costs

Daily Reports Entered on Individual Monthly Sheet for Each Truck — Total Operating Cost of New 7-Ton Trucks 23 Cents per Mile

A SYSTEM of motor-truck operating records kept with no other help than the truck drivers and regular garage clerks, and employing only three printed blanks, provides the Timroth Motor Trucking Co., Chicago, with data sufficient for analyzing truck performance and costs in as many ways as are needed in haulage operations, and to any degree of exactness. Tabulations given further on indicate one sort of analysis possible. Emphasis, however, belongs on the fact that the records kept provide all the data needed for any line of investigation, without involving much labor or expense.

The bases of the system of records are a brief and simple daily report card turned in by the driver and a more complete daily report card made up from this and from data available at the garage by the office force. The driver's report card, besides the truck number, the date and the name of the driver, bears the amount of gasoline and oil consumed, the distance traveled, the destination of each trip and the load carted, and any remarks as to delays or repairs. All this information is transferred to the card made out daily for each truck at the garage, to which is also added the revenue earned by the truck during the day. A separate file of these cards is kept for each truck, and at the end of the month the information is transferred by days to a large regular record sheet kept for each truck, which balances the earnings of the truck against the cost of its operation. Under earning data this sheet shows the number of miles and the number of loads per day, the character of material carried, and its weight, the rate at which it was billed, and the total revenue derived from its transportation. The operating cost is divided into five heads: gasoline, oil, grease, operating labor, and repairs and replacements. Under each of the first three of these are entered both the quantity of material and its cost, while the labor cost of driver and helper is entered under the fourth. The heading for repairs and replacements is divided into columns for the cost of materials, the cost of repairs and renewals to batteries, the cost of tires, and the cost of labor. The daily cost is totaled, and in addition there is entered on the monthly sheet from the daily report card the number of hours the truck was in actual operation, and the number of hours it was idle. Under the latter heading the time is split into "plant delay," which includes delays for loading and unloading; delays due to repairs to the truck; and delays on the road. A very accurate check on these items is obtained from a service clock placed on each truck, which records graphically on a paper disk the time the truck is running and the time it is standing.

Exemplifying the practical use of this system of records is the table of truck operating costs given herewith. Keeping the records began May 1, 1917, and so the cost data cover only nine months' operation to Jan. 31, 1918. Twelve trucks were operated in May, 15 trucks in June and 17 trucks for the remainder of the time; all the trucks were new 7-ton Sterling trucks. Totals only are given in the tabulation; averaging some of the main items the following figures are obtained:

Miles per load	8.25
Miles per hour	4.77
Weight per load, tons	5.54
Miles per quart of oil	9.45
Miles per gallon of gasoline	2.52
Repairs and replacements per mile, cents	2.04
Total operating cost per mile, cents	23.00
Daily mileage per truck	34.43
Daily operating expense	$10.03
Working hours per day	7.27

All of the trucks were new when put in service, and the tire cost was based, for the purpose of figuring the total cost per mile, on the maximum rate of replacement necessary under the guarantee of the maker. The actual amount of money spent each month for tires, however, was less than the estimate, because the tires were new.

The table as compiled shows the average length of haul, the average speed and the average weight per load, in addition to the length of time run and the cost of the various items of operation. Other tabulations, however, of more value in estimating the cost of work, can readily be obtained from the monthly record sheet of each truck. It is possible, for instance, to go through the sheets and tabulate the performance

OPERATING COSTS OF 17 SEVEN-TON STERLING MOTOR TRUCKS OWNED BY TIMROTH MOTOR TRUCKING CO., CHICAGO, FROM MAY 1 TO DECEMBER 31, 1917

Month of Operation	Miles Traveled	Number of Loads	Total Weight of Loads, lbs.	Gasoline Gals.	Gasoline Cost	Oil Qts.	Oil Cost	Grease (Estimated)	Driver	Repairs and Replacements (b) Tires	Repairs and Replacements (b)	Total Operating Expense (a)	Hours Run
May	8,931	1,378	16,611,370	3,519	$695.88	864	$69.60	$30.00	$757.20		$25.28	$1,577.96	1,782
June	10,503	959	14,745,830	4,004	800.80	1,036	94.86	37.50	947.70		116.37	1,997.23	1,959
July	15,144	1,737	25,576,765	5,357	1,076.32	1,525	131.35	42.50	1,478.85	$121.66	184.66	2,913.68	3,014
August	16,487	2,043	20,212,166	6,061	1,223.59	1,729	142.08	42.50	1,661.30		212.88	3,282.35	3,615
September	18,989	1,696	24,570,445	6,313	1,335.26	1,472	143.06	42.50	1,665.06	257.72	378.28	3,564.16	3,538
October	13,715	1,882	27,092,830	5,264	1,111.87	1,268	114.74	42.50	1,596.65	135.64	379.30	3,245.06	3,034
November	19,463	1,566	22,531,100	7,647	1,661.37	2,043	178.68	42.50	1,956.29	538.22	457.19	4,296.03	3,677
December	10,708	2,123	26,469,110	4,544	955.39	1,290	103.20	42.50	1,161.00	271.26	375.07	2,637.16	2,012
January	11,736	4,279	19,802,500	7,069	1,518.06	2,070	170.26	42.50	2,155.19	189.90	433.62	4,319.63	3,721
	125,676	17,663	195,612,126	49,778	$10,378.54	13,297	$1,147.83	$365.00	$13,379.24	$1,514.40	$2,562.65	$27,833.26	26,532

(a) Does not include cost of tires; (b) Includes labor cost for making repairs and replacements.
Table should be studied with appreciation of the fact that since the dates named prices of oil, gasoline, grease and wages of drivers have advanced.

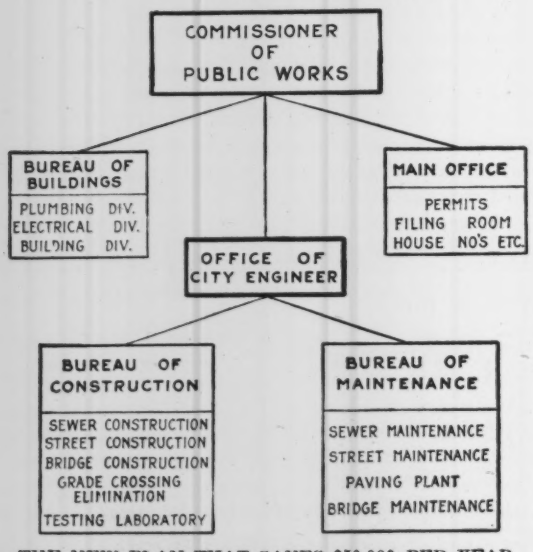
of several trucks in the hauling of certain kinds of material, or in covering a certain length of haul with a certain class of freight. Thus, when the conditions of loading and discharging, the character of freight, and the length of haul are known, it is easy to determine accurately the cost of a piece of new work. It is also easy to determine the effect, upon the cost, of new methods of supervision or of new devices. For instance, a large number of trucks were employed, during the period covered, in transporting asphalt. The company had them fitted with false metal-lined bodies, so that the time required for dumping the load was considerably reduced. The cost system could be readily used to show the actual money value of this saving in time, and at once demonstrated the economy of buying false bodies.

During the period covered by the tabulation the trucks were employed mostly on road work, hauling asphalt and concrete materials, and to some extent for transporting general freight in and about Chicago.

Wartime Reorganization Reduces Overhead in Public Works Department

REDUCTION of the force of the Department of Public Works of Portland, Ore., from a total of 185 to 129 employees, with a reported increase in efficiency and a large decrease in the payroll, was recently effected by a reorganization. The department previously consisted of a rather elaborate system of bureaus which made the overhead heavy. In making the change as many of the employees as could be utilized to advantage under the new plan were retained, but even so there were eliminated five engineers, three chief inspectors, six inspectors, two instrumentmen, four computers (whose duties were assumed by draftsmen), three supernumerary clerks and 33 other employees, or 56 in all.

Under the old arrangement the city engineer had charge of four bureaus, each with its own subdivisions. The Bureau of Highways and Bridges, for example, had a sidewalk division, a bridge maintenance division, a pavement construction division and a pavement maintenance division. There was also a Bureau of Sewers, which had both maintenance and construction divisions, each with its own system of handling office matters, inspection, etc.



THE NEW PLAN THAT SAVES $50,000 PER YEAR

Under the new plan all work done under the direction of the city engineer is handled by one of two bureaus, the Bureau of Maintenance and the Bureau of Construction. Each of these is in direct charge of a competent engineer. This brings into one office all records of new work and into another single office all records of maintenance work. City officials say this has greatly simplified office routine. The Bureau of Buildings is taken out of the hands of the city engineer and, like the main office work (including filing of records, permits, etc.), is under the direction of the Commissioner of Public Works. This official is provided with a capable assistant so that detailed attention can be given to such matters.

With this reduced force and a more compact organization, the amount of construction now being handled is equal to that previously done under the old organization, and the maintenance work is greater, as the Bureau of Maintenance now operates its own municipal asphalt repair plant. In anticipation of this reorganization, the current annual appropriation for this department was reduced from $308,000 to $258,000. The latest report is that the department will this year require only about 90% of the appropriation.

Concrete Computations Simplified by Standard Blanks

Original Work Is Made Easier and Checking Is Facilitated by Systematic Recording of Design Figures

By Walter W. Clifford
Structural Engineer, Hyde Park, Mass.

WHILE many of the larger structural engineering firms realize the need of system in recording computations, fear of multiplying expensive forms often deters men with smaller practices from attempting any standardization of computation records. As a rule, this fear is not well founded in concrete work. Rarely will some such system as the one proposed here be anything but a saving in time and money.

In deciding on a standard design form, the first consideration is, "Which items do we wish to make plain?" The first use of design sheets is to give information to the draftsman. The results then must be clearly indicated (and frequently they are the only thing that is plain), but for the benefit of checkers and executives all the assumptions of stress and loading should be equally well indicated. Also, a year later another structure may be desired with the same stresses or same loads; or information may be required as to the ability of the structure to withstand different loading conditions from those originally planned for. All this information should be easily available.

The assumed data goes logically at the head of the sheet, and a consideration of the problem of concrete beams and slabs will give a heading of the type shown on the following page, which should be on a quadrilled sheet.

Firm Name and Address

Job..... No.....

BEAM AND SLAB COMPUTATION SHEET

Computed by..... Checked by..... Final Sheet No...
Prelim. Sheet No.
Date

Remarks:

Mix..... Member.....

Allowable fc =	fs =	n =			Clear span	=		
Allowable v =	R =	p =			Bearing span	=		
Uniform load =	x	x	=	Lbs.	Panel width	=		
Self " =			=	"	Live load	=		Lbs.
Partition load =			=	"	....in. slab	=		"
" =			=	"	Plaster & grano	=		"
" =			=	"		=		"
Total " =			=	Lbs.	Loa per sq.ft.	=		Lbs.

This accounts for the data. Then should follow a space, preferably quadrilled in the interest of neatness. for the computation of moment, flange width, steel area, shear, bond, etc. If—as should be the case in most offices—computation methods are standardized, such things as M = ———, V = ———, etc., may well be printed in convenient places on this portion of the sheet. If this be done every step in the design can be easily noted and checked.

At the bottom of the sheet will be shown the results. If a standard beam section be printed on each sheet it will save hours of drawing. With this section a form for tabulating data on "Straight Bars," "Cambered Bars" and "Stirrups" will complete the information. A definite space in which to note all this data will minimize mistakes of draftsmen and omissions of designers. A standard column design sheet can be worked out on similar lines with a place for everything. These two sheets will cover the major part of the concrete members.

There will always remain some special members which are not amenable to standard forms. Footings are perhaps the largest group in this class. Such special members are best treated by using a plain quadrilled sheet with a heading similar to that suggested for the beam sheet, and following a standard routine. This standard routine or method of arrangement for each type of design should be embodied in complete computations for typical examples neatly worked out. These sheets should then be posted or furnished in office data books so as to be readily accessible at all times. If these standard computations are followed in method and as closely as possible in arrangement, all the advantages of the printed form are attained except the economy of printing.

Changes in Concrete-Road Practice in Wayne County, Michigan

Slab Width and Thickness Generally Increased—Two-Mix Construction Proves Satisfactory—One-Way Roads Established

PRACTICE on concrete-road construction in Wayne County, Michigan, has passed through many changes since it was inaugurated, and while the majority of these changes have not been drastic, in the aggregate they bulk large. Thus Edward N. Hines, chairman of the Board of County Road Commissioners, summed up the situation in an address before the Michigan State Roads Association at Detroit Sept. 3. During the past year the minimum width of road has been increased to 18 ft., and a width of 20 to 24 ft. is being recommended for the sections adjacent to cities. The slab thickness has also been considerably increased, and two-course construction, which was tried out a year or more ago. has been permanently adopted. Regulation of traffic on Sundays and holidays has been effected by establishing one-way roads in certain sections. A brief abstract of Mr. Hines' paper follows:

While all parts of the country report that the roads are going to pieces under heavy motor-truck traffic, brought about by railroad congestion and the desire of the public to move merchandise, in Wayne County, which on July 1 had 57,633 licensed passenger motor cars and 9988 motor trucks of various capacities, not to mention thousands of motor trucks built for war purposes in Detroit and vicinity which use the roads, traffic has been carried over concrete roads seven, eight or nine years old, without any appreciable sign of wear. This experience emphasizes the wisdom and economy of building roads to fit the traffic, rather than restricting traffic to fit the roads, and it is against progress to regulate traffic to save a weak road, as such action will ultimately result in the destruction of the road itself.

To accommodate the increasing traffic the county road commission has increased the thickness and width of its roads during the past year, and believes that it is necessary to have a greater volume of concrete, irrespective of the mix, in order to withstand vibrations set up in the road by heavy, fast-moving motor trucks. It is the opinion of the commission that a well built concrete road will be eventually worn out not so much by abrasion as by vibration.

The road thickness has been increased from an average depth of 7¼ in. to an average depth of 8¼ in., being 7 in. at the edges and having a flat subgrade and a crown of ¼ in. to the foot. This gives 8¼ in. at the center for an 18-ft. road.

While 18 ft. is the present standard width, the county commissioners are advocating to the Board of Supervisors, the body in which final control rests, the adoption of a 24-ft. concrete road which will be 32 ft. over all for roads built 10 miles out from the limits of cities. Some progress in this direction has been made on one of the principal jobs, connecting the Jefferson and Mack roads, which is being built 24 ft. wide. The main roads are already so congested with motor trucks and trailers that travel has become difficult and dangerous to the passenger car and horse-drawn vehicle, and it has been found advisable on Sundays and holidays to make the Jefferson and Mack roads one-way roads for 12 miles out from the center of Detroit and through a number of small villages, the traffic going out by the Jefferson road. crossing by the Vernier road to the Mack road for the return trip. A further advantage of the widening is the economy effected by eliminating the large expense of macadamizing and graveling the shoulders, together with the necessity for continual maintenance and oiling to keep down the dust.

Recently the county changed its specifications to two-course construction, substituting crushed Wisconsin granite or trap rock for pebbles in the wearing course.

Despite the greater cost, the new construction is believed to be justified by the quality of the finished job. Fewer cracks develop in the roads built with crushed stone in the top course than in those built from pebbles. The use of the term "two-course" is somewhat of a misnomer, as the wearing surface is laid when the base is still wet, and it is compacted and becomes an integral part. A "two-mix" road would be a better term.

Several changes have been made in the use of expansion joints. While these are still placed at 25-ft. intervals, the thickness of the asphalt composition joint filler has been increased from $\frac{3}{8}$ to $\frac{1}{2}$ in., and the filler is placed just below the finished roadway, the concrete being carried over it with the strikeboard. Steel armored joints have been discontinued, owing to the scarcity and high price of steel and the difficulty in getting absolutely even joints. Excellent results have been obtained with submerged joints in eliminating irregularities, and when the film of concrete which covers them finally breaks, they can be maintained with Tarvia and coarse sand. The entire elimination of expansion joints is not considered good practice in Wayne County; rather, the county has increased the joint $\frac{1}{8}$ in. in width.

The county has established a minimum of 100-ft. radius for curves, and, where necessary, extra right-of-way is acquired to obtain this radius. A policy of superelevating all curves of 700-ft. radius or less has been established. This superelevation is obtained gradually so as not to be disagreeable to the rider. On sharp turns the pavement is widened out and the outer edge is banked 18 in. higher than the inner edge. Twenty-five miles per hour, the highest legal speed in Michigan, is the speed taken for computing superelevation.

Signposts of reinforced-concrete 10 ft. high and placed in a suitable concrete foundation are being erected at all important intersecting roads and are designed not only to be a permanent ornament to the road, but also to furnish useful and accurate information. They replace advertising signs and boards tacked on telephone posts or elsewhere, which are not allowed on the right-of-way of Wayne County roads. Provision is also made for placing electric lights on each post as soon as funds are made available, so that the traveling public may obtain distances and directions at night.

While it has been the practice of the county to keep all roads under its jurisdiction open for travel in winter as well as in summer, the importance of this work had not been fully appreciated until forced on the attention of the country at large during the severe weather and heavy snowstorms of last winter. This was particularly so on account of the congested freight-traffic conditions. No trouble was experienced at any time with snow on Wayne County roads, thanks to the efficient organization. Three superintendents have charge of road construction in the summer and have districts to take care of in winter. They are furnished with snow plows, scrapers, graders and shovels. Each superintendent is required to inspect his road and to have lists of men and team owners who will turn out for road cleaning. When a big snowstorm comes he gets at work in the shortest possible time. This method of taking care of the roads enables travelers to proceed in the usual manner and also prevents snow and ice ruts which concentrate traffic in one or two ruts.

Twenty-Mile Sewage and Reclamation Channel Proposed

By R. G. McMullen

Department of Public Works, Portland, Ore.

SEWERAGE and land reclamation for the peninsular district of Portland, Ore., the city engineering department concludes, can best be effected by dredging the Columbia Slough for 20 miles. The sewage would be discharged into the channel until the growth of population would warrant the building of a long intercepting sewer.

Some 20,000 acres of land outside the city could be included in the drainage and reclamation district. The peninsular district proper includes 10,000 acres of land between the Columbia, and Willamette Rivers, in which is located the Columbia Slough.

It is proposed to dredge a channel with a depth of 12 ft. at low water, bottom width of 200 ft., top width of 300 ft. and length of 20 miles. The dredged material would be used to form a roadway or boulevard embankment and to fill in low areas. The two natural lakes at

DREDGING COLUMBIA SLOUGH WOULD SOLVE SEWERAGE AND DRAINAGE PROBLEM

the upper end of the channel would retain silt from the Columbia River water; or by building a dam across the Sandy River and a channel therefrom to the lakes clear water could be obtained for dilution and channel flushing.

The dredging cost for the 20-mile channel is estimated at $1,000,000. Of this it proposed to request $500,000 from the United States, $200,000 from the State of Oregon and to raise $300,000 from the port of Portland and from sewerage and drainage assessments on the property benefited.

O. Laurgaard is city engineer and O. E. Stanley engineer of sewers of Portland.

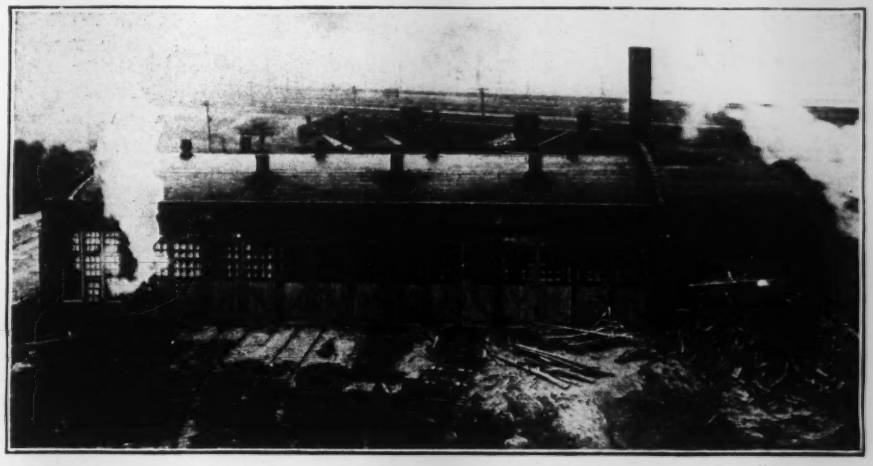
Water-Supply Costs Show High Increase

Before the Public Service Commission of Indiana the Terre Haute Water-Works Co., in asking for increased rates, recently presented data, on increased costs of operation and maintenance, that varied from 5% to 207% above those of 1914. The percentage increases noted were as follows: Coal, 161%; alum, 44; bleach, 207; white lead, 85; waste, 88; cylinder oil, 5; envelopes, 40; order blanks, 29; average wages paid clerks, inspectors, engineers, firemen, filtermen and station helpers, 16%, and common laborers, 25%.

Rectangular Engine House Avoids Use of Turntable

Reinforced-Concrete Building Has Arched Roof On Timber Lattice Trusses—Engine Stalls Have Swinging Doors

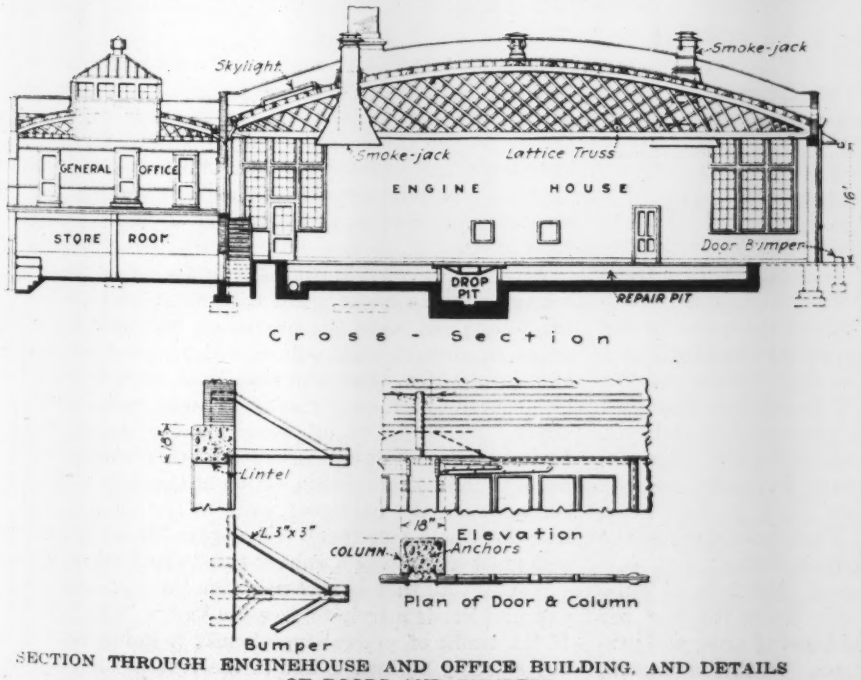
AN UNUSUAL type of locomotive engine house built recently at South Chicago, Ill., for the Chicago Short Line Ry. is a rectangular building with parallel tracks and direct switch connections, in place of the usual segmental roundhouse with radial tracks served by a turntable. This design was adopted on account of the high cost and uncertain delivery of a turntable, while plenty of yard space was available for the track approaches. The building includes also the general offices and accommodations for the convenience of the employees. The railway is a 15-mile switching and terminal line serving a group of blast furnaces, steel mills and industrial plants, and having seven locomotives. The engine house proper is about 83 x 120 ft., divided into eight bays. Seven of these have tracks spaced 14 ft. on centers and the eighth forms a machine shop for repair work. The engine pits slope to an end drain and two of them have deep drop pits for handling locomotive driving wheels. In the drop pits is a track of 24-in. gage for a truck with a hydraulic jack for lowering and raising the wheels, this track extending to the repair shop.



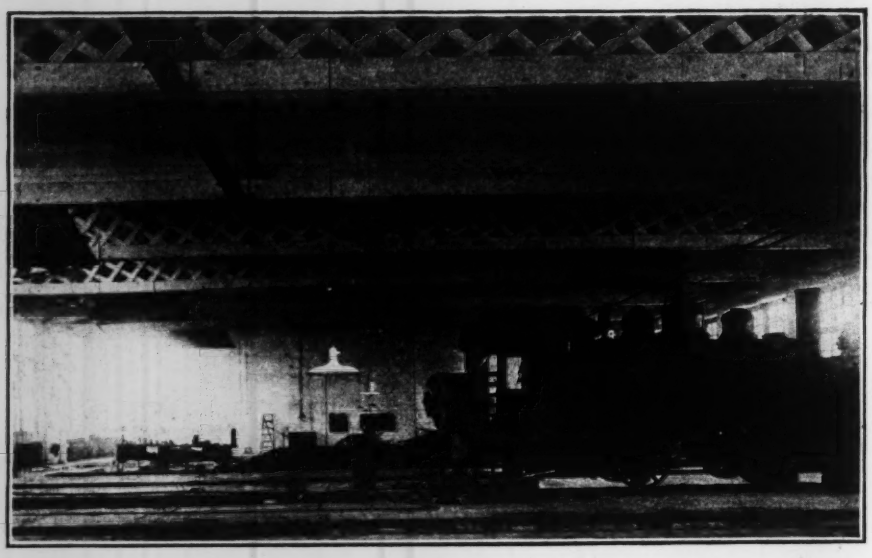
RECTANGULAR ENGINE HOUSE HAS PARALLEL TRACKS FOR SEVEN ENGINES

Mill-type construction and brick walls were used for the building. The track side consists mainly of concrete columns and a heavy lintel, the openings being fitted with swinging doors which have glass in the upper panels. Each door is carried by four heavy strap hinges anchored to the concrete columns. The doors are prevented from swinging beyond a 90° arc by means of steel bumper frames anchored to the lintel, and by 12 x 12-in. concrete posts set in the ground.

The barrel-arch roof is of a type new for engine-house construction. It consists of seven timber lattice trusses of the McKeown patented type, of 83-ft. span, so that the entire floor space is left clear. The trusses have curved top chords, and some of the web members project above these to supports joists upon which is laid the diagonal plank sheathing with composition covering. The end joists are carried by the walls. A line of struts or sway braces extends between the trusses. Similar construction is used for the roof of the general office, but with a flat ceiling carried by the bottom chords. The middle truss has the web planked solid to form a fire stop. Over the drop pits is a 12-in. I-beam with a trolley hoist for handling driving wheels. This is suspended from the top chords of the trusses by hanger rods. Exhaust ventilators are placed on the crown of the roof, and cast-iron smoke jacks are placed over opposite ends of alternate tracks. The general offices are on the upper floor of a two-story annex in the rear of the engine house. There are private offices for the general superintendent and treasurer, also a vault, locker room, toilet rooms and a



SECTION THROUGH ENGINEHOUSE AND OFFICE BUILDING, AND DETAILS OF DOORS AND BUMPERS



INTERIOR OF HOUSE—WOOD LATTICE TRUSSES CARRY THE ROOF

rest room for the women employees. The first floor is used as a storeroom, with a three-stall fireproof garage at one end. The smaller two-story annex has on the upper floor a yardmaster's office and a large room for entertainments and meetings. This is about 32 ft. square and has a kitchen adjacent to it. Beneath this is a boiler room and a washroom with toilets and showers for the use of the yardmen and shopmen.

This combined engine house and office building was designed and built by Freyn & Co., engineers and contractors, Chicago. J. Fred Sheehy is president of the Chicago Short Line Ry. and W. F. Booth is general superintendent.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Proposes Caterpillar Mountings for Highway Motor Trucks

Sir—Perhaps the greatest problem that will confront this country in the reconstruction period, and in new construction to follow the war, will be the necessity for providing for a maximum of heavy highway traffic at a minimum of cost. In the consideration of this problem truck manufacturers generally, if thoughtful, must feel somewhat despondent, shippers more or less dubious, and highway engineers well nigh desperate. The appalling cost of providing highways generally, such as would sustain the expected traffic along present lines, may be assumed as prohibitive. What, then, must be the solution, if the traffic is to be accommodated?

The most obvious treatment would seem to be in legislation which would limit to a safe figure the load per inch of tire width, or per unit of bearing area, and perhaps the speed for the heavier loads. In this treatment, in the writer's opinion, lies the real remedy, in that it would force the practice in truck design to meet the requirements. It must be accepted as the only remedy, if it is admitted that on account of excessive cost the remedy cannot be found in road construction alone. The heavy wheel-mounted trucks of today, with their heavy loads, are nothing more nor less than engines of destruction to our highways and city pavements, and are not to be tolerated permanently. Are highway engineers sufficiently concerned in the question of the possibilities of traffic regulation and truck design, and are truck manufacturers and shippers sufficiently concerned in the question of the cost of highway construction, maintenance and preservation?

The writer suggests that, if such loadings are to continue as those for which the heavier trucks now in use are planned, the caterpillar or multipedal mounting must eventually come into universal use on these trucks. The cost of maintenance of trucks so mounted would be greater, perhaps, but would it not be better to place a moderate burden of that nature directly where it belongs, rather than have the cost of road construction doubled or quadrupled or made prohibitive, solely because of the specific needs of that particular interest?

The larger-sized trucks of today should not travel our highways at a speed in excess of 10 or 12 miles per hour, as a matter of safety to the traveling public, as well perhaps as a matter of economic operating speed. This is a limit easily within the reach of recent developments in caterpillar or multipedal design and practice. Such a mounting can easily be designed for a given load to meet any requirement that may be made with regard to the proper protection of any highway. Trucks so mounted would ordinarily be able to operate readily over more or less unimproved roads as well, making the desired schedule, and at the same time without destroying such roads.

After seeing what is proposed in the recent design of a large-capacity motor truck with multipedal mounting, the writer has made the prediction that, within a few years, in view of what will be demonstrated by the design in question, state and municipal requirements will be generally such as virtually to make compulsory the similar mounting of all heavy-tonnage motor trucks. In the particular design referred to, there cannot be the usual pounding or abrasive action of the links in making contact with the pavement, even at considerable speed, and the whole movement will apparently be as smooth and quiet as that of a rubber-tired wheel mounting.

Usually, all that is necessary for the best solution of any problem is merely to face the known facts squarely. If the traffic of present-type trucks is going to destroy our existing highways, and if the cost of the resulting

maintenance, or the cost of road construction adequate for that traffic, is prohibitive, then must the problem become, by suitable legislation, one for the truck maker and the shipper rather than for the highway engineer. If the shipper then finds, as is likely, that the heavy-tonnage truck is indispensable, the truck maker must take the necessary steps in his design to meet the respective requirements of the shipper and the highway engineer. Sound economic principles may be applied to the regulation of highway traffic, as well as to highway construction; and the facts should be faced squarely before the roads of the country are destroyed.

Greenville, Miss. W. L. THOMPSON.

[The foregoing statements suggest a problem for consideration which warrants careful thought from all interested in motor-truck transportation. If, as the writer suggests, there is a mechanical means available which would allow for motor-truck transportation over unimproved roads, it would certainly be utilized to the limit in this time of transportation shortage. In the absence of other means of transportation it might be used to transport the material for further road-building at this time, for which there is so much need. Coöperation, as *Engineering News-Record* has reiterated, is the only way to settle these problems, and the lack of it emphasizes daily the great need. Let those most interested in the solution stop talking about it and get together.—Editor.]

Heavy Motor Trucks and the Highways

Sir—Referring to Charles F. Dingman's letter in your issue of Sept. 5, p. 462, I would state that the street construction on Murray St., New York City, in 1887 was from the plans of the late Gen. Roy Stone, who was then serving, as I was at that time, on the staff of Gen. John Newton, chief of engineers, U. S. A. Later General Stone was director of public roads in the Department of Agriculture.

At present, it would be impossible to spare the necessary material for the shallow troughs of steel or wide rails.

COL. T. HUGH BOORMAN,
New York City. British and Canadian R. M.

Why Not a Three-Stage Concrete Mixer?

Sir—The effect of water on the strength of concrete, as noted by Prof. D. A. Abrams in *Engineering News-Record* of May 2, 1918, p. 873, is very astonishing in many ways, and yet our experiences of the past few years have been leading us to the conclusion that the amount of water had a greater effect than was formerly thought to be the case. Professor Abrams has some very good evidence as to just what the effect of water is. We have all seen 1:2:4 concrete apparently no better than 1:4:10, and never knew why. We have studied failures of rich concrete without arriving at satisfactory reasons therefor, and we have seen what was apparently a very ordinary concrete perfectly water-tight, when in adjacent work was a very rich concrete which would leak like a sieve. It looks as though Professor Abrams had progressed a long way toward a solution of some of our perplexing questions. The writer has always thought that most of our concrete has been mixed as the Englishman said our cocktails were: A little sugar to make it sweet, a little lemon to make it sour, a little whisky to make it strong, and a lot of water to make it weak.

Keeping the ratio of water to cement at a minimum brings up the question as to how we can hold the ratio down and yet keep the mass fluid enough to be properly mixable.

Are the best results obtained in our ordinary commercial mixers? Is it reasonable to expect the best results by dumping all materials, water, cement, sand and broken stone, together into a revolving box, and expect to take out in a couple of minutes a perfectly mixed concrete?

Would an engineer who had never seen a mixer design one such as those we use, if he were asked to design one from first principles? Possibly he would, but the writer believes that better results would be obtained if we did the mixing in what the writer calls a "three-stage mixer," by first dissolving (not in a chemical sense) the cement in the water in the first stage; then mixing this solution with the sand, in the second stage, and then mixing this grout with previously wetted broken stone, in the third stage. No time would be lost, as by placing two smaller mixing boxes on our machines stages 1, 2 and 3 could be in progress on three batches at the same time.

One reason for the concrete requiring an excess of water to become mixable is to enable the stone to be thoroughly coated with grout; but by obtaining a more nearly fluid grout first, this could be accomplished with less water. Surely segregation would be obviated.

Possibly stages 1 and 2 could be combined so as to make a two-stage process, but it appears that for work of the highest class concrete should be made in a three-stage mixer, for second-class work in a two-stage mixer, and for rough work an ordinary commercial one-stage mixer should be used. Of course, in case of gravel two stages only would be necessary.

In any event, it might be advisable to consider that when writing specifications for concrete the ratio of proportions should include the fourth element, as for instance: $\frac{W}{\frac{1}{2}} : \frac{C}{1} : \frac{S}{3} : \frac{ST}{5}$ instead of $\frac{C}{1} : \frac{S}{3} : \frac{ST}{5}$.

FRANK B. WALKER.

Boston Army Supply Base, Boston, Mass.

[At one of the cement shows, some years ago, there was exhibited a two-stage mixer. It was not a very sturdy machine and was not backed by a strong commercial organization; so far as is known it is not now manufactured.—Editor.]

Typhoid Carrier Delays Water Service

Discovery of typhoid germs at the intake of the new Wilson Ave. water tunnel, Chicago, caused the health commissioner to prohibit the putting of this tunnel into service for several days beyond the date originally proposed. The tunnel and the mains had been thoroughly cleaned by pumping water through them, but shortly before the date set for operation the analyses of water in the well at the intake crib disclosed the presence of typhoid bacilli. Investigation showed that one of the men working at the intake was a "carrier." Use of this new supply system was postponed therefore until conditions were safe. The tunnel is now in service.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Device Eliminates Careless Handling and Saves Empty Cement Bags

By E. Earl Glass
Monrovia, Cal.

TWO bars bolted to the platform of a mixer to form a shelf upon which the cement handler piled his empties was the device used on a recent contract to eliminate the usual carelessness in handling and the loss of bags. This method of piling the bags was found much better than the old method of throwing them outside the edging, and also made it convenient for the inspector to keep track of the amount of cement used.

The shelf formed by the bars was about waist high and formed a very convenient place for the cement man to place his bags. For the purpose of keeping track of the number of stacks a stick was placed upon every tenth bag; when fifty had been piled, they were tied into a neat bundle with baling wire and tossed upon the roadside. The inspector in making his day's count marked the bundle with crayon and entered the number and station in his log. A team then picked up the bundles and hauled them to the siding, and an accurate record was kept of the amount of cement used, without the loss of an empty bag and without extra expense to the contractor.

Other Articles of Interest to Contractors In This Issue:

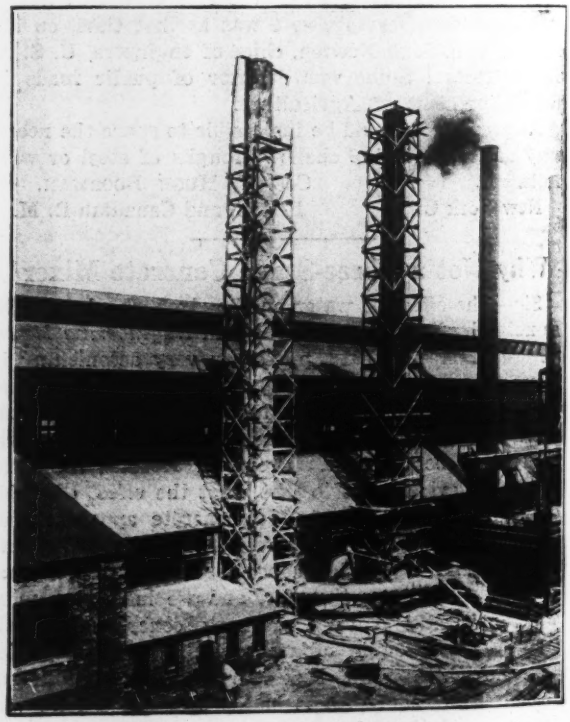
Construction Camps Model Towns on Miami Flood Works — Page 575
Sinking Six Cylinder Foundations a Day on Boston Army Supply Base — Page 584
Illinois Farmers Aid Contractors in Finishing Road Work — Page 588
Drivers and Garage Clerks Keep Contractor's Motor Truck Costs — Page 589
Why Not a Three-Stage Concrete Mixer? (Letter) — Page 595

Rusting Steel Chimneys Coated with Concrete by Cement Gun

FIVE steel stacks, at the Pittsburgh Crucible Steel Co.'s Midland works, which had become very badly corroded in service, were recently covered entirely on the outside with a reinforced-concrete shell, at comparatively small expense and without putting the stacks out of service, except for a few days. The concreting was done with the cement gun, operated by a workman standing on a scaffolding in the first two chimneys, and in the more recent work on a hanging scaffold.

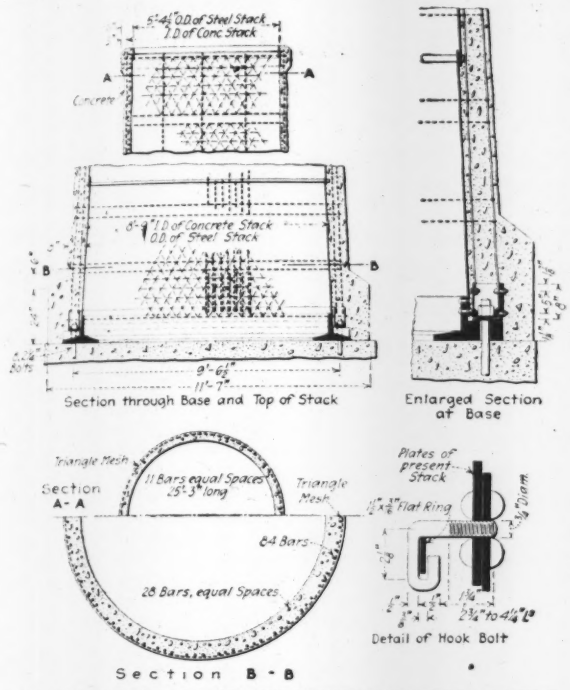
The stacks are 125 ft. high and approximately 6 ft. in diameter at the top, with an outside diameter of 12 ft. at the footings. The steel in the plates was very badly corroded from the gas which found its way through the brick lining of the stack. Corrosion was very general, and in places a man could thrust his forearm through the plates. The coating comprised a self-supporting annular ring of reinforced concrete, varying in thickness from 8 in. at the base to 3 in. at the top, the reinforcement being securely fastened to the steel plates of the stack itself. At each ring of the stack, that is, at vertical intervals of about 5 ft., hook bolts were tapped into the plates of the stack. These bolts carried horizontal steel bands held a fixed distance about 2 to 4 in. away from the shell. These bands in turn carried vertical reinforcing rods of square twisted steel, around which was wrapped the annular ring of wire mesh shown in the views. This mesh varied in spacing and size of wire with the thickness of the concrete to be applied. In the lower 20 ft. two rows of vertical rods were placed, the wire mesh being attached to the outer row. Above the 20-ft. height the one row of vertical rods which carried the mesh was placed near the outer face of the concrete.

The concrete was applied through the cement gun onto and through the wire mesh. A compressor with the cement gun was installed in a near-by house, and the hose with the nozzle was carried up as the work went along. In the beginning the scaffolding shown in the view was used,



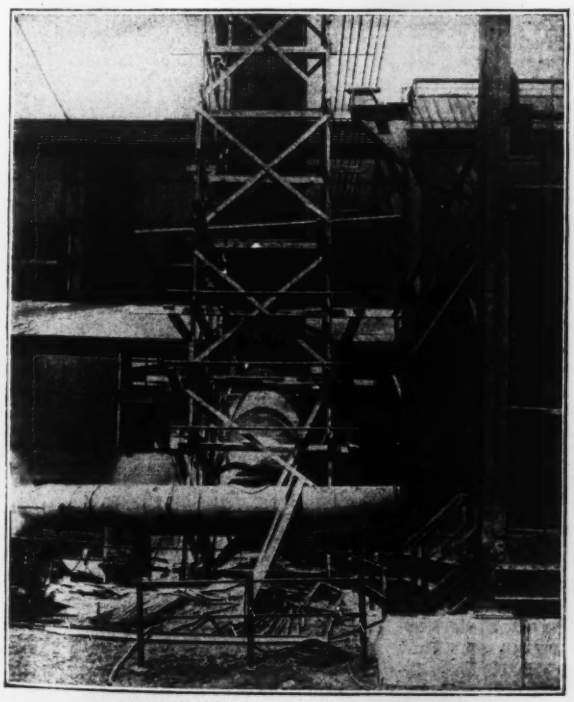
125 FOOT STACKS CORRODED BY GAS ARE REPAIRED BY APPLYING CONCRETE WITH CEMENT GUN

but after the completion of the second stack it was thought that better results could be obtained by the use of swinging scaffolds, and these were installed



DETAILS OF THE REINFORCEMENT FOR THE CEMENT GUN COATED CHIMNEYS

with considerable success. The stacks were kept in operation during the progress of the work, except for a few days on each while the concrete was being applied to the upper part. During these few days the stack was cut out of service so that the material would not dry out too quickly, the upper parts receiving less protection from the heat of the gases than the lower section.



CONCRETE APPLIED FOR THE FIRST TWO FEET OVER THE WIRE-MESH REINFORCEMENT

About 20 to 25 sq.ft. of concrete was applied a day. Each stack required 11 cu.ft. of finished concrete, reinforced with about 1½% of steel.

The work was done by the Baker-Dunbar-Allen Co. of Pittsburgh, Penn., under the direction of J. P. Clarke, superintendent of construction, and W. F. Glasser, general superintendent.

Adhesive Waterproofs Drawings and Tracings Without Crimping

BY JOHN S. CARPENTER
Springfield, Ohio

WATERPROOFING of drawings and tracings so that they can be used in wet places, as in mines, is done by the use of a preparation composed of rubber and benzol.

The compound in less dilute form also makes a paste with which to join tracings and maps without the crimping of the joint that commonly occurs when water pastes are used.

The pure gum rubber which is required for this waterproof paste can be bought at wholesale drug houses. The benzol can be obtained at most paint stores.

Benzol dissolves rubber, and the compound thus formed will keep in any climate and under any conditions. As benzol is inflammable, it should be kept in a safe place in a covered jar. If the proper precautions are taken in its use, however, it is no more dangerous than kerosene.

In a quart jar put a piece of rubber about 4 in. square; to this add a half pint of benzol. The rubber will soon swell to three or four times its former bulk and will be ready for use in about 24 hours. To prepare for use take about half the above quantity and put it in another jar for thinning down. If drawings are to be coated use a rather thin solution that will spread well under a brush. The drawing should be coated on both sides. For use as an adhesive, the solution should be fairly stiff, so that if it is desirable afterward to separate the joined parts it can be done more readily than if thin paste is used. There are cases where large tracings and blueprints must be made up of smaller sections, and for this work the paste is invaluable, as the joints will not be crimped out of shape and alignment.

When some of this solution was spilled accidentally on a dirty drawing the benzol was mopped up with a rag and the rubber was rolled up into a ball. The drawing was cleaned very nicely during the operation. This suggested an additional use for the preparation.

Rubber bands instead of pure gum rubber were tried; but it was found that they would not dissolve, merely swelling to many times their former size. Formaldehyde was also tried as a solvent, but its objectionable odor and certain other characteristics have proved it to be undesirable. When diluted as above directed the pure gum paste will not be costly.

NEWS OF THE WEEK

New York, September 26, 1918

American Ship Construction Is Now Overtaking All Ship Destruction

Nearly a Third of World's Pre-War Tonnage Has Been Sunk, But Construction Has Made Up Two-Thirds of Loss

Figures just given out by the United States Shipping Board show that in August the tonnage of commercial ships built in American yards passed the total allied and neutral losses for the month from enemy activities. During that month the Germans sank 259,400 gross tons (about 390,000 dead-weight tons) and the American yards turned out 261,000 gross tons (about 393,000 dead-weight tons). The status of world tonnage on Sept. 1, 1918, is given in the accompanying table, which includes the above noted data.

It will be seen from this that in the fifty months of war 21,404,913 dead-weight tons, or approximately 30% of the total allied and neutral tonnage of July, 1914, has been destroyed. This represents an average of 285,000 tons monthly if distributed over the whole period, but this is not a fair comparison, inasmuch as the German sinkings did not start until 1916. Even on the basis of a general average, however, American construction is beginning to exceed destruction, which is itself rapidly decreasing. The figures also show that two-thirds of the tonnage lost has been replaced by construction, not counting the enemy tonnage captured or seized.

The rapid increase of American shipbuilding is reported by the board as in Table II. The board's statement reads:

"Within the jurisdiction of the United States Shipping Board on Sept. 1, 1918, there were 2,185 seagoing vessels, totaling 9,511,915 dead-weight tons. Of these, 1,294, totaling 6,596,105 dead-weight tons, fly the American flag. Under charter to the Shipping Board and to American citizens there are 891 foreign vessels, totaling 2,915,510 dead-weight tons.

"At the time the United States entered the war the American merchant marine included approximately only 2,750,000 dead-weight tons of seagoing

(Concluded on page 600)

TABLE I—STATUS OF WORLD TONNAGE, SEPT. 1, 1918
(Germany and Austria excluded)

	Dead-weight Tons
Total losses (allied and neutral) August, 1914-Sept. 1, 1918	21,404,913
Total construction (allied and neutral) August, 1914-Sept. 1, 1918	14,427,825
Total enemy tonnage captured (to end of 1917)	3,795,000
Excess of losses over gains	3,362,088
Estimated normal increase in world's tonnage if war had not occurred (based on rate of increase, 1905-1914)	14,700,000
Net deficit due to war	18,062,088

In August, deliveries to the Shipping Board and other seagoing construction in the United States for private parties passed allied and neutral destruction for that month. The figures:

	Gross (Actual) Tons
Deliveries to the Shipping Board	244,121
Other construction over 1000 gross	16,918
Total	261,039
Losses (allied and neutral)	259,400
America alone surpassed losses for month by	1,630

NOTE.—World's merchant tonnage, as of June 30, 1914, totaled 49,089,552 gross tons, or, roughly, 73,634,328 dead-weight tons. (Lloyd's Register.)

TABLE II—INCREASE IN AMERICAN SHIPPING

	Number	Dead-weight Tons
Requisitioned American ships	449	2,900,525
Ex-German and ex-Austrian ships taken over	100	644,713
New ships owned by Shipping Board	256	1,465,963
Old lake steamers transferred	31	117,800
American merchant ships not yet requisitioned (of over 1500 dead-weight tons)	377	980,459
Dutch steamers requisitioned	81	486,945
Foreign ships chartered to Shipping Board	291	1,208,411
Foreign ships chartered to American citizens	600	1,707,099
Total	2185	9,511,915

SHIPS LAUNCHED AND DELIVERED

	Wood Ships		Composite Ships		Steel Contract Ships		Requisitioned Steel Ships		Total	
	No.	D.w. tons	No.	D.w. tons	No.	D.w. tons	No.	D.w. tons	No.	D.w. tons
Launched	170	599,450	13	48,500	130	708,300	261	1,660,988	574	3,017,238
Delivered	238	1,486,599	56	347,935	33	117,500	8	66,357	335	2,019,032

Contractors Organize for War Conditions

November 20 and 21 Set as Date For Chicago Meeting to Form Permanent National Association

Finding the organization of the contractors of the United States in a representative national association "necessary and feasible," the temporary executive committee formed to create such an organization met in New York on Monday and Tuesday last and issued a call to all general contractors to attend a national convention to be held in Chicago Nov. 20 and 21 next, at which a national association will be perfected.

The committee, as announced in *Engineering News-Record*, was originally appointed at the convention of the building industries held July 18 in Atlantic City, and was subsequently enlarged to make it representative of all sections and existing organizations. It drafted a tentative form of constitution which was considered and revised at the meeting, and which will form the basis for action of the convention. The main features of this constitution were announced in *Engineering News-Record* of Aug. 1, p. 245.

On account of war work of various sorts it was not possible, it is announced, to select a date on which the entire committee could assemble, but members representing associations of contractors in Buffalo, Memphis, Detroit, Boston and New York undertook to go ahead with the business of calling the convention on authorization, by telegram and letter, from all but four of the committee asked to serve. The absent members, it is stated, presented their views in writing on the proposed constitution and purposes of the organization, and without exception urged that early action be taken.

The committee adopted the following resolution:

"Whereas, it is the sense of the committee that the organization of the general contractors of the United States into a national association is necessary and feasible; therefore,

"Be it resolved that a convention of the general contractors throughout the country be called to meet in Chicago on Nov. 20 and 21 next, for the purpose of forming a permanent organization; and

"Be it further resolved that an invitation be extended to all general contractors to attend, and that the invitation set forth fully the purposes for which the convention is called."

After the passage of this resolution it was decided to call the committee

together in Chicago just prior to the convention, at 10 a.m. on Nov. 18.

War service and the position of the contractor during the remainder of the war, including both means for rendering the most efficient immediate service and means for maintaining the war volume of construction work so far as it will not interfere with the needs of the Government, are understood to have taken up a large part of the discussion, and plans which can be put into effect immediately after a permanent organization is formed were considered.

S. A. T. C. Courses Emphasize Map Making and Sanitation

Sanitation and hygiene, map making, topography and surveying are emphasized in the outline of the curricula for the Students' Army Training Corps, as announced by the committee on education and special training of the War Department. In general, the program for study in the students' training corps are included in the following groups: Group 1, infantry, field artillery; group 2, air service; group 3, ordnance and quartermaster service; group 4, engineer corps, signal corps and chemical warfare service, and group 5, motor transport and truck service. In all of these groups hygiene and sanitation and surveying and map making are included as essential subjects. For instance, in group 1 (infantry and field artillery) sanitation and hygiene comprise 9 hours of the prescribed 53 hour a week training, and surveying and map making comprise 12 hours. In group 2 (air service) map reading and navigation comprise 12 hours a week.

The course so far prescribed for the Engineer Corps under group 4 is as yet designated only as "an approved program in any branch of engineering studies," and for the Signal Corps "an approved program of studies in electrical engineering."

General Morrow Chief Engineer of First American Field Army

Official announcement just made of the personnel of the command of the first American field army in France shows that the chief engineer is Brig. Gen. Jay J. Morrow, one of the best-known officers in the Corps of Engineers. General Morrow was graduated from West Point in 1891 and passed the early years of his service in the corps at Willets Point and in the New York City fortification work. He was for a number of years connected with the engineering work at Washington, D. C., both as engineer commissioner and as officer in charge of the Washington Aqueduct. Later he was on the Alaska Railroad Commission, which made the recommendations followed later in the construction of a Government railroad there. His last position before the war was that of maintenance engineer on the Panama Canal. General Morrow commanded the 4th Engineers in France.

Regional Highway Transport Directors Meet

Form and Discuss Definite Program for Utilization of Highways—Officials Co-operate

Regional directors of highway transport from all parts of the United States met in Washington Sept. 16-18 to discuss the problems of organization of highway transportation in the various States. The meeting was held under the auspices of the highways transport committee of the Council of National Defense. A definite program of specific use of the highways, in support of both the war plan and the reconstruction policy for post-war times, was developed at the conference of the 11 chairmen representing the regions into which the country has been divided.

Some time ago the Highways Transport Committee appointed the regional directors, each to have charge of one or more states, according to the size of the problem. Under this plan each state has its own highway transport committee, each county has a subcommittee to help work out the problem, and every township will have its subcommittee. When the system is fully organized there will be more than 15,000 members of the various committees.

Recognition of the highway's value as a transportation resource was evidenced at the conference by the appearance before the committee and its chairmen of cabinet officers, members of the Railroad Administration, the Food Administration, the War Industries Board, the National Highways Council, the Electric Railways War Board, the Army and the United States Senate. President Wilson received the conferees at the White House on the conclusion of the sessions.

Rural Expresses Urged

Various governmental agencies proposed close coöperation between their respective organizations and the Highways Transport Committee. Herbert C. Hoover, Federal food administrator, approved the development of the rural express as a means of saving perishable foodstuffs now produced, for stimulating production of more food, for lowering costs of living, and for conserving farming man power for the soil. He observed that 50% of the perishables produced in America are wasted, largely through ineffective means of getting them to market. Fast, intimate service by rural expresses, he foresees, will be a great source of saving. By the use of motor expresses, Mr. Hoover pointed out, the farmer need not maintain so many draft animals on the farm, animals that eat the crops of millions of fertile acres that otherwise could be devoted to raising food for people. The failure of the public market in America, Mr. Hoover said, was caused by inadequate transportation of an intimate sort, and he believes that a developed rural express will give public markets a basis for economic success and tend toward lower price levels.

Franklin K. Lane, secretary of the interior, tied the highways development into his plan for putting millions of returned soldiers and their families on small farms carved by the Government from great areas of public domain now either unused or in need of reclamation.

"I can see the making of a new America," said Secretary Lane, "a nation of farming communities and small industrial centers. These centers must be developed and tied together and made easy of access by good roads, over which the most efficient of transport will move goods to market."

Highway, Waterway and Railway

William C. Redfield, secretary of commerce, told the regional chairmen that he regarded highway, waterway and railway as a trinity of economic usefulness, incapable of full function unless all factors of it were developed efficiently. He pointed out that the perfection of the internal combustion engine has given both highways and waterways a new tool—the motored vehicle on the roads, the motored barge on the rivers and canals. He remarked that though the Hudson River were bordered with three times the rail lines it has now, and its waters ploughed by all the ships it could carry, still the farmer living inland five miles from it would fail to profit unless access to docks and depots by rural expresses were afforded.

Secretary Redfield said he regarded legislation to restrict the size of motor trucks in order to save the roads as a menace to development of highways transport, as intolerable as it would have been to have stopped locomotive development forty years ago because engines and cars were getting too heavy for the light rails of those days. Our transportation routes must be fitted to the new tools, he declared.

Relief for the railways by another of the Highways Transport Committee's projects—the store-door delivery system—was welcomed by Edward Chambers, formerly vice-president of the Santa Fé railroad, now director of traffic in the Railroad Administration. He urged the chairmen to promote the trucking of less-than-carload shipments from the manufacturing centers to communities 30 or 40 miles out, and the coöperation of the highway regional chairmen with the railways' regional traffic directors, to facilitate the clearing of the terminals in the larger cities.

Mark L. Requa, director of the oil division of the Fuel Administration, asked the committee's coöperation in a campaign to promote more efficient operation of all gasoline-propelled vehicles and the conservation of fuel through the stopping of wasteful practices and nonessential running.

The Army was represented before the conference by Lieut.-Col. W. D. Uhler, Q.M.C., in charge of army truck convoy service. Lieutenant-Colonel

Uhler bespoke the coöperation of the chairmen in providing for the clearing of roads during the coming winter, when, as it has moved for nine months now, the Army will be moving long trains of motor trucks from inland factories down to the seaboard, under their own power and cargoed with munitions.

Joseph D. Baker of the War Industries Board's staff asked the chairmen to help make clear to motorists and garage managers the necessity for saving both materials and man power, and suggested ways in which such savings can be effected.

Reports made by the regional chairmen show increases of tonnage as high as 400% over last year.

The regional chairmen, all but one of whom were at the entire conference, are J. Randolph Coolidge, Jr., Boston; George H. Pride, New York; C. A. Musselman, Philadelphia; Thomas Winn, Atlanta; Harry L. Gordon, Cincinnati; John J. Stockton, Chicago; J. F. Witt, Dallas, Tex.; Julius H. Meier, Portland, Ore.; L. A. Nares, Fresno, Cal., and Earle Brown, Minneapolis.

American Ship Construction

(Concluded from page 598)

vessels of over 1,500 dead-weight tons."

The fleet lists on Sept. 1, 1918, were as indicated in Table II.

There are now 203 shipyards under the United States Shipping Board; 77 for steel ships, 117 for wood, two for composite and seven for concrete ships. Of these 155 are completed. The yards have 1020 ways, which the board says is more than double the total shipways in the rest of the world. In these yards, during the year ending Aug. 30, 1918, more than 2,000,000 dead-weight tons of new ships were delivered, as shown in the second part of Table II.

The program of ship construction as announced is as follows:

	Dead-weight Tons
2249 contract ships, totaling	13,212,712
42 concrete ships, totaling	301,500
402 requisitioned ships, totaling	2,790,792
2693 ships	16,305,004

"The Shipping Board has also contracted for the construction of 170 wood barges, 279 tugs, 100 trawlers, and 25 harbor oil barges, totaling 50,000 dead-weight tons."

Government Railroad Completed to Alaska Coal Fields

Completion of the 190 miles of Alaska railroad reaching from tidewater to the Matanuska coal fields has been effected. At the close of the active working season last year there was a gap of 16 miles on the main line between Anchorage and Seward, the southern terminal of the railroad. This gap was along Turnagain Arm, and involved some of the most difficult construction work on the whole line of the railroad.

Safety Measures Profitable in Construction

Engineers and Contractors Form Organization at Safety Congress to Further Work

Injuries to workmen, now more prevalent in construction in proportion to the numbers employed than in any other industry, can be reduced materially by preventive methods differing not greatly from those successfully employed in other industries. Progressive construction companies have demonstrated the fact that safety engineering is practicable. Their records show that accident prevention reduces labor turnover and loss of time, increases the earnings of the workmen and saves money for the employer. Education is necessary, no less for the employer than for the workmen themselves. These are the outstanding lessons of the deliberations of the construction section of the National Safety Council, during the seventh annual safety congress held in St. Louis Sept. 16-20.

Officers were elected and a permanent construction section of the National Safety Council was organized Sept. 18. Tentative efforts have been made from time to time for several years toward this end, but it was not until about four months ago that these efforts assumed practical form. Then the National Safety Council engaged Sidney J. Williams as manager of the accident prevention division of the council. Time was short in which to develop a construction accident prevention program for the congress, but, aided by a few enthusiasts in the field, he succeeded in arranging a schedule of six formal papers and several impromptu talks, and in obtaining the attendance at the meetings of the section of some sixty men prominent in the construction industry. The construction section temporarily organized for the congress was made a permanent section, with L. D. Von Woedke, of the Fred T. Ley & Co., Springfield, Mass., as chairman; W. J. Lynch, of the Thompson-Starrett Co., Chicago, as vice-chairman, and E. W. Bush, of the Aetna Life Insurance Co., as secretary. Working with Mr. Williams as an official of the National Safety Council these officers will not only plan a program for next year's congress, but will also promote various activities during the year which will aid construction firms to organize and execute accident prevention measures.

Possibilities in accident prevention were set forth in the first paper of the meeting by Mr. Von Woedke. Insurance rates as affected by accident prevention were discussed in a paper by H. L. Geisler. As secretary of the Builders' Limited Mutual Liability Insurance Co., of Wisconsin, Mr. Geisler quoted the saving in accident costs to the contractor policy holders of the company, by very simple means. As policy holders these contractors became vitally concerned in reducing injuries to their workmen, and this is the first great object to be attained in all accident prevention propaganda. Support of the contractors being assured, education of their workmen proceeded by means of bulletins and frequent addresses on safety methods, delivered to groups of workmen. In this last activity the interest of heads of labor unions was engaged so that they would order their members to attend the meetings. The results of these simple methods have been to reduce materially both frequency and cost of accidents.

Experience of the General Builders' Association of Detroit, Mich., working with the insurance interests to reduce accident costs, was outlined in a paper by F. S. Robinson, secretary of the association. This organization of 11 builders, only two years old, has reduced accidents and insurance rates very greatly by educational work. Every job handled by a member is directed according to the recommendations for safety of the insurance experts. Bulletin boards carrying safety placards are installed on every job; the workmen are assembled at intervals to listen to safety talks, and field aid classes are conducted for superintendents and foremen by physicians of the insurance company.

Engineers Ask Railroad Wage Board for Hearing

Onerous conditions imposed upon the railroad technical engineers by reason of wages alleged to be too low to meet living expenses have been brought to the attention of the officers of the American Association of Engineers so many times, not only by individual members but by many who are not members, that the association has petitioned for a special hearing on the subject before the Board of Railroad Wages and Working Conditions. One petition, signed by the engineering corps of the Michigan and Logansport division of the Pittsburgh, Cincinnati, Chicago & St. Louis Ry., states the following wage conditions: (1) Increases under order No. 27 are not sufficient to cover the normal increase in cost of living; (2) salaries paid to engineers are not consistent with salaries paid in other lines of engineering work, nor with salaries paid men over whom the engineer has supervision. In some cases these men are receiving double and treble the compensation of the engineer.

Referring to reports of the statistician of the United States as to the increased cost of food, the figures are 3% for the month of July, 15% for the past year, and 69% for the past five years. Investigation of the local markets in Logansport places the increased cost of the necessities at 160%. [Figuers compiled by the United States Food Commission and released Sept. 23 give the increase in the total national food bill during the year which ended June 30, 1918, as 3.2%, but it is stated that the percentage increase in rent, clothing, transportation and other items is several times greater.]

Comparison of wages is made with contractors' forces as follows: Foreman, $225, as against $135 to railroad's engineer, with 13 years' experience, in charge of construction; contractor's chief clerk and team foremen get $150; steam shovel engineer, $200; crane men, $150; firemen, $125; and dump foremen, 55c. per hour. Against these figures are four assistant engineers with salaries and years of experience as follows: $123.25, seven years; $105.75, three years; $98.75, three years; $95.90, seventeen years.

Varied Program for Municipal Improvements Convention

Discussion of and reports on a wide variety of subjects, included under the general heads of paving, sewage, water-supply and refuse disposal, form the basis of the program of the twenty-fourth convention of the American Society of Municipal Improvements, to be held in Buffalo Oct. 2-4. If the convention of 1917 had not been omitted, this would have been the twenty-fifth convention of the society. The preceding convention was held in Newark, N. J., in 1916.

After the registration of delegates the Buffalo meeting will open on the morning of Oct. 2 with committee and subcommittee meeting to discuss street paving subjects. These will be followed by the evening session, which will listen to the president's address, the report of the executive committee, the report of the finance committee, and the report of the special committee on standard tests for bituminous materials. The morning session of Oct. 3 will be devoted to a discussion of sewage problems, including the Miles acid process for the recovery of grease from sewage, the pressing of sewage sludge, and the private sewerage question. The session will also include the report of the committee on sewage and sanitation.

The afternoon session of the same day will be devoted to the report of the committee on street paving, as well as various papers on paving subjects, including the maintenance of old asphalt pavements, and the report of the committee on sidewalks and street design. The evening session will be devoted to business matters of the society, in addition to the reports of the committee on standard specifications, street lighting, municipal legislation and street occupation under franchises.

The "jubilee session" to be held on the morning of Oct. 4 will be devoted to papers on the early history of the association, its recent history, and statistics and the documentary history of the society, as well as reports by the committees on parks and parkways, city planning, traffic and transportation and fire prevention. The afternoon will be given over to an automobile trip through the city of Buffalo and its surroundings, including visits to the city water-works and industrial plants.

Notes from the Field

It was my good fortune during the first week of this month to fall in with the mining engineers at their convention in Denver and Colorado Springs. They are an intensely human crowd—"regular fellows," in the vernacular of the day. They are close to the realities of life in mining camps, unspoiled by the pretense and conventions of the city. There was a frankness and heartiness that we do not find in the cañons of Broadway and State Street.

And yet, when the men from the open threw themselves, between sessions, into the moment's duty of having a good time, the city fellows joined in. They were just as human, but they had been concealing it. There was not the same abandon, but the hard-pavement boys had a good time, nevertheless.

Expressive of the character of the crowd was the fact that all joined in singing "Onward, Christian Soldiers," after unexpurgated outbursts of "Mary Ate Some Oysters," and "Hail, Hail, the Gang's All Here." That was at the dinner in Denver. At Cripple Creek, after a basket luncheon, the Doxology followed the same tuneful ditties. As one New Yorker expressed it, "Can you beat it?"

And the ladies present, the wives of these same rollicking, substantial mining engineers, realizing that the boy spirit for the time was uppermost, smiled indulgently, and if they did not join in the "Mary" and "Gang" songs, their voices were loud and sincere in the hymns.

Intelligent Publicity

One other feature of the convention of the American Institute of Mining Engineers I should record. The publicity was intelligently handled.

By publicity I mean not blatant notices of the meeting, but newspaper items that told the story of the convention and emphasized in nontechnical language the thought of important papers, and, in consequence, gave to the local papers and those in the intermountain mining country a correct idea of what occurred.

The institute has here set an example worth following. Various engineering societies have had good publicity in their home and headquarters cities. I do not remember any intelligently handled away from home. Under the usual procedure, the reporters are passed from one man to another, finally reaching a clerk or assistant who has too many details in his hands to be able to give the reporters intelligent assistance. Consequently, the latter content themselves with brief notices or make their own attempts to tell something about the technical proceedings—the latter efforts invariably ending in garbled reports that make the engineers smile derisively, and misinform the public.

The institute has followed the sensible course of making some one man responsible for seeing that the newspaper men get the assistance they need. In fact, the responsible man at this meeting took the further—and wise—step of preparing a brief résumé of each session's proceedings and placing it at the disposal of the reporters.

This procedure is of benefit to the institute, of service to its many non-attending members who thereby are kept informed at once of the distant convention doings, and of help to the profession generally in informing the public about the work of the engineer.

Paraphrasing the newspaper line, "Other societies please copy."

E. J. M.

Engineering Societies

Calendar

Annual Meetings

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS; 304 East Walnut St., Bloomington, Ill.; Oct. 2-4, Buffalo, N. Y.

AMERICAN PUBLIC HEALTH ASSOCIATION; 126 Massachusetts Ave., Boston, Oct. 14-17, Chicago.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS; A. Dennis Williams, Morgantown, W. Va., acting secretary; Dec. 2-6, Chicago.

CITY MANAGERS' ASSOCIATION; Harrison Grey Otis, Auburn, Maine, secretary-treasurer; Nov. 6-8, Roanoke, Va.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York City; Dec. 3-6, New York.

The Associated Engineering Societies of Seattle held a meeting Sept. 17 which was devoted to the subject of fuels of the Pacific Coast. The papers presented were "Coal," by Amos Slater, "Mill Waste," by H. W. Beecher, and "Combustion," by C. V. E. Dove.

The Detroit Engineering Society was addressed by Prof. Henry S. Jacoby of the civil engineering department, Cornell University, on "Recent Progress in Bridge Construction," at a meeting held Sept. 20. Professor Jacoby's address dealt with the principal features of the world's greatest bridges, and made special reference to progress during the past seven years.

The Vermont Society of Engineers will hold its fall meeting at Montpelier, Oct. 2-3. On the first day of the meeting Prof. G. H. Perkins, state geologist, will present a paper on "The Geology of Central Vermont and Smugglers' Notch." The second day of the meeting will be devoted to an automobile trip to the mill and mine of the Magnesia Talc Co., near Waterbury, and thence over Vermont's first strip of Federal aid highway to Waterbury, followed by an inspection of the new highway which the state is building.

The Minnesota Joint Engineering Board elected the following officers at a meeting held in St. Paul, Sept. 21: President, W. F. Hoyt; vice-president, R. J. S. Carter; secretary-treasurer, G. H. Herrold.

The Western Society of Engineers held a meeting Sept. 23 in Chicago under the auspices of the hydraulic, sanitary and municipal section, at which William G. Edens, president of the Illinois Highway Improvement Association, spoke on "Good Roads in Illinois." Mr. Edens explained the need for improved highways and the proposed $60,000,000 bond issue to be voted on Nov. 5. The Illinois centennial photoplay, "Through Illinois Over Unchanged Roads in a World of Change," was shown.

PERSONAL NOTES

PAUL G. REDDINGTON, city manager of Albuquerque, N. M., since the city-manager plan went into effect last January, has resigned to resume his work as district forester in the Government Forestry Service.

W. H. WOODBURY, valuation engineer of the Duluth & Iron Range R.R., has been made valuation engineer also of the Duluth, Missabe & Northern Railroad.

EVERETT EDGAR KING has been appointed professor of railway civil engineering at the College of Engineering of the University of Illinois. Professor King was graduated from Rose Polytechnic Institute in 1901 with the degree of bachelor of science, receiving the degree of civil engineer in 1908 and the degree of master of science in 1909 from the same institution. In 1910 he received the degree of master of civil engineering from Cornell University. He was engaged in railway work in the United States and Mexico for seven years and was professor of civil engineering at the Agricultural and Mechanical College of Oklahoma from 1907 to 1910. From 1911 until his recent appointment he was professor of railway engineering at Iowa State College.

ANTON ANDERSON, principal assistant engineer of the Chicago, Indianapolis & Louisville Ry., has been made engineer for the corporation.

A. M. PARKER, division superintendent of the Pennsylvania R.R. at Camden, N. J., and formerly principal assistant engineer, has been transferred to the Philadelphia terminal.

J. H. REDDING, division engineer of the Pennsylvania R.R. at Camden, N. J., has been transferred to Altoona, Penn., and is succeeded by W. E. Brown, division engineer at Elmira, N. Y.

W. J. BERGEN, first assistant to the chief engineer of the New York, Chicago & St. Louis R.R., has been made corporation engineer. Mr. Bergen was born in 1872 and was graduated from Rensselaer Polytechnic Institute in 1897. He entered the employ of the Burlington & Missouri River R.R. in 1899, and became division engineer the next year. A year later he went to the New York, Chicago & St. Louis as assistant engineer. In 1907 he was made chief supervisor of track and later the same year was promoted to the post he now leaves.

MAJ. A. MARSTON, Engineers, U. S. A., formerly dean of the School of Engineering, Iowa State College, is now Lieutenant-Colonel Marston.

A. R. HEBENSTREIT has been appointed city manager of Albuquerque, N. M., succeeding Paul G. Reddington, who has resigned, as mentioned elsewhere in these columns.

C. E. ARNOLD, city engineer of Woodland, Cal., has resigned to become engineer in charge of drainage and irrigation work for the Los Alamitas Sugar Co., the property of which consists of 20,000 acres between Long Beach and Los Angeles.

JAMES W. BEEBE, engineer for the San Joaquin Light & Power Co., with headquarters at Fresno, Cal., has been commissioned as captain in the Engineer Officers' Reserve Corps and assigned to duty at Camp A. A. Humphreys, Virginia.

CHARLES H. RUST, who recently resigned as city engineer of Vancouver, B. C., as mentioned in *Engineering News-Record* of Aug. 22, p. 380, has become associated with the Toronto Railway and allied Mackenzie interests.

W. S. READ, assistant engineer with the Kansas Public Utilities Commission, has been commissioned as first lieutenant in the Engineer Officers' Reserve Corps and assigned to duty at Camp A. A. Humphreys, Virginia.

FRANK LAF. ANDERS, city engineer of Fargo, N. D., has been commissioned as captain in the construction division of the Quartermaster's Department.

THOMAS C. ATWOOD, who for the past year has acted as supervising engineer in charge for the Navy Department of the construction of the Squantum destroyer plant, has been appointed district plant engineer for the third district of the United States Shipping Board, Emergency Fleet Corporation, with headquarters in Baltimore.

RUDOLPH WELCKE, supervising engineer for the Navy Department in charge of construction in the Baltimore district, has been appointed supervising plant engineer for the United States Shipping Board, Emergency Fleet Corporation, and will have charge of construction of dry docks and marine railways along the Atlantic coast.

W. G. MASSENBURG, division engineer of the Gulf, Colorado & Santa Fé Ry. at Beaumont, Tex., has been appointed district engineer of that road, the St. Louis-San Francisco & Texas, and other lines, with headquarters at Galveston.

GEORGE NAUMAN, assistant engineer, Pennsylvania R.R., with headquarters at Oil City, Penn., has been appointed assistant to the chief engineer, with headquarters at Pittsburgh.

C. E. NEWELL, of the valuation department of the Southern Ry., with headquarters at Washington, D. C., has resigned to enter the construction department of the Tennessee Coal, Iron & Railroad Co. at Ensley, Ala.

MAJ. J. P. JACKSON, Engineers, U. S. A., previously dean of the School of Engineering, Pennsylvania State College, has been promoted to the rank of lieutenant-colonel.

GEORGE KENDERDINE and George Patton, transitmen, Pennsylvania R.R., have been appointed assistant engineers, with headquarters at Pittsburgh.

T. EDWARD OLSEN, resident engineer, New Jersey State Highway Commission, with headquarters at Trenton, has been commissioned a first lieutenant in the Engineer Officers' Reserve Corps and assigned to duty at Camp A. A. Humphreys, Virginia.

COL. T. HUGH BOORMAN, of the British and Canadian Recruiting Mission, who had been engaged in military highway and construction work, has severed his connection with the recruiting mission to establish offices in New York City as a consulting engineer.

H. S. MARSHALL, chief land appraiser of the Chicago, Burlington & Quincy R.R., has been appointed valuation engineer, succeeding W. W. K. Sparrow, whose appointment as chief engineer of the Chicago, Milwaukee & St. Paul corporation has been noted in these columns.

E. J. CLEAVE, division superintendent of the Pennsylvania R.R. at Trenton, N. J., has been appointed terminal manager of the Allegheny region, U. S. Railroad Administration, with headquarters at Philadelphia. He will have jurisdiction over the Philadelphia terminals of the Pennsylvania, Philadelphia & Reading and Baltimore & Ohio Railroads and over the Philadelphia Belt Line in that city. Mr. Cleave has been in the service of the Pennsylvania since 1881. From 1886 to 1889 he was assistant supervisor. For the following eight years he was supervisor. In 1897 he was appointed

division engineer at Williamsport, Penn.; in 1900 he was made principal assistant engineer at Altoona; in 1902 he was promoted to division superintendent at Cresson, Penn., and in 1917 was transferred to Trenton.

L. M. PERKINS, engineer maintenance-of-way of the Northern Pacific Ry., lines west, at Tacoma, Wash., has been made engineer for the corporation, with office at St. Paul. Mr. Perkins' entire service, since his graduation from Dartmouth College in 1903, has been with the Northern Pacific. In 1906 he became assistant engineer of construction and the following year division engineer. In 1910 he was made engineer maintenance-of-way of the eastern lines, and in 1911 transferred to the western lines.

EDWARD J. CLAIR, engineer in the Bureau of Sewers of the Borough of Queens, New York City, has been commissioned as first lieutenant in the Engineer Officers' Reserve Corps.

JOHN HEWES, JR., has been appointed division engineer of the Baltimore & Ohio R.R., western lines, at Flora, Ill., succeeding R. E. Chamberlain, who is transferred to a similar post at Chillicothe, Ohio.

H. D. NEWELL, Hermiston, Ore., engineer on the Umatilla irrigation project for the past twelve years, has been transferred to other Government work in the vicinity of Denver. H. M. Shilling, who has been engaged in the work of the Reclamation Service in Montana, succeeds Mr. Newell.

E. R. BREAKER, chief engineer of the San Antonio, Uvalde & Gulf R.R., has been appointed assistant mechanical superintendent.

W. T. MEAD, acting group engineer of the western group of the Presidents' Conference Committee, has been appointed assistant valuation engineer of the Illinois Central R.R., succeeding D. W. Thrower, whose promotion to valuation engineer was noted last week in these columns.

A. F. BATES, acting town engineer of Montclair, N. J., since the resignation of Maj. Christopher Harrison, has been appointed town engineer.

C. A. JENNINGS, manager of the Chicago office of the Wallace & Tiernan Co., and previously superintendent of the Bubbly Creek filtration plant of the Union Stockyards, Chicago, has been commissioned as captain in the Quartermaster Corps and assigned to duty in the construction division of the maintenance and repair branch.

H. N. RODENBAUGH, and not S. S. Roberts as indicated in the organization chart for the United States Railroad Administration in *Engineering News-Record* of Sept. 12, p. 503, is the engineering assistant to the Southern regional director. His title is staff officer—engineering. He was formerly principal assistant engineer in the valuation department of the Southern Ry. Mr. Roberts is a member of the Southern regional organization, reporting to Mr. Rodenbaugh.

OBITUARY

WILLIAM KENT, Montclair, N. J., former dean of the L. C. Smith College of Applied Science, Syracuse University, and associate editor of *Engineering News* for several years previous to 1903, died at Gananoque, Ont., Sept. 18, in his 68th year. After graduation from Central High School, Philadelphia, in 1868, Mr. Kent entered Stevens Institute in 1875, shortly after which

WILLIAM KENT

he assisted Prof. R. A. Churstons on the Government board appointed to test iron and steel and other metals. From that time until 1890 he held many important positions as mechanical engineer and superintendent in various large iron and steel works and boiler manufactories, including the Torsion Balance Scale Co.'s factory, where he developed the torsion balance. From 1895 to 1903 he was associate editor of *Engineering News*, and then for five years was dean of the L. C. Smith College of Applied Science of Syracuse University. Since that time he had practiced as a general consulting engineer. He contributed numerous valuable papers and discussions to the engineering societies in which he held memberships, and to technical journals, and wrote many technical books, among which is Kent's "Mechanical Engineers' Pocket Book," which reached its ninth edition in 1915. He had taken out more than twenty patents on weighing machines, boilers, smokeless furnaces, etc. He was an active member of many engineering societies from 1876, as follows in their order: The American Institute of Mining Engineers (member of the board of managers for two years); American Association for the Advancement of Science (vice-president for one year); Engineers' Society of Western Pennsylvania (treasurer for two years); American Society of Mechanical Engineers (manager three years, vice-president one year); American Society of Heating and Ventilating Engineers (member board of governors, vice-president and president); Society for Promotion of Engineering Education and the Engineers' Club of New York.

MARTIN SCHENCK, formerly state engineer and surveyor of New York, died in Albany Sept. 17, in his 69th year. Mr. Schenck was born at Palatine Bridge, N. Y. He was graduated from the department of engineering in Union College in the class of 1869, and soon after entered the service of the Missouri, Kansas & Texas R.R. in the construction department. After his connection with the M., K. & T. he entered the service of the Union Pacific, and was placed in charge of bridge construction at various points. Returning to the East in 1872 he became employed in contracting and railroad work. From 1874 to 1880 he was engaged in private practice, specializing in hydraulic and power plant engineering. Mr. Schenck was appointed assistant engineer for the improvement of the upper Hudson River under the jurisdiction of the Canal Department in 1883, and remained continuously in the service of that department until 1892, when he was elected state engineer and surveyor, two years later becoming consulting engineer to the State Board of Health. He was again nominated by the Democrats for state engineer and surveyor in 1898, but was defeated.

LIEUT. ARTHUR TREMBLAY of the firm of Cobe, Tremblay & Pearson, civil engineers, Edmonton, Alta., was accidentally killed in London recently while training for the air service. He enlisted in 1915 and saw service in France, where he received a wound which incapacitated him for further land service, after which he enlisted in the air service.

LIEUT. ROBERT B. WOODBURY, Pennsylvania Engineers, was killed in action on the western front Aug. 14. Lieutenant Woodbury had been mentioned in recent dispatches from the front for conspicuous gallantry in action.

WILLIAM WOODBURN, who for a number of years was chairman of the exhibit committee of the New England Water-Works Association, died of pneumonia in Boston, Sept. 9. Mr. Woodburn was New England representative of the Warren Foundry and Machine Company.

NEWS OF ENGINEERING INDUSTRIES

FOR MANUFACTURERS WHO SERVE ENGINEERS AND CONTRACTORS

Steady, Consistent Driving Need of Liberty Loan

Success Will be Won by Determination of the Committees—New Draft Will Take Away Subscribers

That the ultimate success of the Fourth Liberty Loan will depend upon steady, consistent driving on the part of everyone interested is indicated in a statement by Chairman Green of the Advisory Trades Committee of New York City. Continuing, he points out that success will be attained more by sheer determination on the part of the various committees than through any other circumstance.

The new selective draft will call to the colors thousands of men, especially those between 32 and 36, who are in the prime of their earning capacity, and who, by giving themselves, will not be expected and in a great many cases will not be able to do their part in the necessary subscriptions to make the loan a success. These are probably the reasons that prompted Chairman Green to state that there will be less of the spectacular than heretofore, and the ultimate success will depend on hard driving by all. Mr. Green's committee is planning to work hard to interest every business man in New York City in the loan and to obtain his assistance in reaching the interest of every one of his employees. "In this way," says Mr. Green, "we believe we will leave nothing neglected which might lead to obtaining the influence, however large or slight, of anyone and every one toward making the new loan a tremendous success."

Lumber Industry Gets Priority

The lumber industry is included in the priority list by Labor Priority Bulletin No. 1. It is addressed by Judge E. W. Parker of the priority division of the War Industries Board to the United States Employment Service and all industrial advisers covering the industry. Charles Edgar, director of lumber, War Industries Board, explains that this statement calls the attention of industrial advisers and the district exemption boards to the essential nature of the lumber industry.

It will be in the hands of district exemption boards, but it will be necessary for each lumber manufacturing plant to present its case before the proper district exemption board (1) by showing the amount of direct Government orders on hand; (2) by showing the amount of indirect Government orders on hand, and (3) by showing the amount of lumber, supplied to others than the Government, which is of primary importance.

Greatest Trade Expansion in History

Increase of $1,000,000,000 in 1918 Shown By Records of Latin-American Commerce

The total trade of the United States with the twenty Latin-American countries for the fiscal year of 1917-18, just closed, shows the unprecedented increase of $1,000,000,000 over that of 1913-14, the last fiscal year before the outbreak of the war. The United States exports to and imports from Latin America reached a total of $1,750,000,000 in the past year, in contrast with $750,000,000 four years ago. The official records prove that nothing equal to this trade expansion has heretofore been known in the history of the world, according to a statement issued by the Pan-American Union at Washington.

In a review emphasizing the present importance of Pan-American commerce, but cautioning against overconfidence, Director General Barrett of the Pan-American Union points out the following figures confirming the statement: United States exports to Latin America grew from approximately $280,000,000 in 1913-14 to $720,000,000 in 1917-18, or 257%, and the imports increased from $470,000,000 to $1,030,000,000 or 214%; the grand total of exports and imports advanced from $750,000,000 to $1,750,000,000, or 235 per cent.

Trade with Chile in the same period jumped from $43,000,000 to $205,000,000, or 375%; Argentina, from $90,000,000 to $305,000,000, or 240%; Cuba, from $200,000,000 to $500,000,000, or 150%; Mexico, from $132,000,000 to

LOCATION OF UNITED STATES BRANCH BANKS

$248,000,000, or 90%; Brazil, from $130,000,000 to $190,000,000, or 46 per cent.

These figures, states the report, emphasize the importance and possibilities of Pan-American commerce, but they must not encourage false hopes as to United States trade of the future. This exceptional growth is due largely, first, to the supplanting by the United States of the trade of the central allies; second, to the caring by the United States for the trade of Great Britain, France, Belgium, Italy, and Holland and other neutrals, for which they, under war conditions, could not provide; third, the heavy war demands of the United States for the raw products of Latin America, and the war demands of the latter for manufactured products of the United States, formerly obtained from Europe.

The closer relations thus forming between the republics of the Americas mark the beginning of the use of a great merchant marine, according to recent statements by Secretary of the Navy Daniels. The recognition of the commercial and other ties and the activities springing up in consequence thereof act as great encouragement to those who have long wished to see closer commercial and friendly ties between these republics, says Mr. Daniels.

The progress that has been made by this merchant marine is illustrated by the construction records, those of August amounting to almost 300,000 gross tons and the total for the year ended Aug. 31, 1918, to almost 2,000,000 gross tons. The problem of the use of this fleet when released from war needs does not bear solely upon the economic use of an available good, but, as recently pointed out by Chairman Hurley of the Shipping Board, as a balancing function during the period of conversion of war-making plants to those of peace industries. Chairman McCormick of the War Trade Board in a recent statement said the merchant marine "means the possibility of free export of American commodities which can be spared under our war program to overseas destinations to help pay for our great war imports for war materials, and to redress the adverse balance of trade running so strongly against us in many foreign countries. Payment for war imports by commodity exports rather than by our limited stock of gold is a war measure of prime importance, and it should not be forgotten that exports of articles to us of nonessential or nonwar character which help us to pay for essential imports may, from a war standpoint, be regarded as essential." Secretary Redfield of the Department of Commerce said: "Great opportunities lie open to us. In South America and elsewhere men seek the credit and the enterprise of which we are now the greatest reservoir. The future of America calls to the present not to neglect it, and opportunity beckons

(Concluded on page 606)

Former Westinghouse Official Now Brigadier General

Guy E. Tripp, formerly chairman of the board of directors, Westinghouse Electric & Manufacturing Company, with headquarters in New York, later colonel United States army and

GENERAL GUY E. TRIPP

head of the production division, has been made brigadier general, United States army, having charge of the production of ordnance material in various sections of the country. The district chiefs will report direct to General Tripp, who is succeeded as head of the production division by Colonel C. C. Jamieson.

Motor Truck Club of America Changes Its Name

The Motor Truck Association of America has found that there has been a good deal of misunderstanding as to its objects and its method of attaining them, due to the word "club" being incorporated in its title, so at a meeting held Aug. 27 it was decided to substitute the word "association" for "club." The change took effect Sept. 19.

Scotland Will Need American Road Machinery After War

After the war there will probably be a strong demand for road-making machines and tools in Scotland, due to the necessity for an intensive construction campaign in that country, according to Consul Rufus Fleming in recent commerce reports. Mr. Fleming states that "since 1914 roads and streets have been neglected; county and city authorities have economized by letting the highways fall into disrepair, and diverting funds usually granted for their upkeep to other purposes." He further states that as a result of this policy the main roads and by-ways are in such condition that large expenditure for reconstruction of surfaces and for repairing and building bridges, culverts, etc., will be necessary, and adds that the extended use of motor trucks, etc., has caused such deterioration of narrow country roads that a large portion of them will have to be rebuilt.

Aid Extended to Electric Co. by War Industries Board

The War Industries Board has decided to extend aid to the Lorain County Electric Co., Ohio, because of the important War Department and Emergency Fleet Corporation war work which is drawing power from that company. The loan will amount to about $400,000, and the Government will share with the company the war wastage.

Labor-Saving Electric Truck

A labor-saving industrial truck driven by electricity is shown in the accompanying illustration. It is used in industrial plants for the hauling of pig iron, castings or finished machinery parts, and it is said to have released for use in more important work twelve men in one plant who formerly handled hand trucks. The steering mechanism controls both the front and the rear trucks, so that it is possible to manipulate the vehicle through crowded machine shops and storage space. It is manufactured by the Crescent Truck Co., Elizabeth, N. J.

ELECTRIC TRUCK ASCENDING 20% GRADE

South American Trade

(Concluded from page 605)

from many a land with insistent finger. Much that we need is waiting for us."

The Webb bill is entitled "An Act to Promote Foreign Trade, and for Other Purposes" and indicates that Congress is alive to the situation. Even before the passage of this law, non-competing industries had already united their forces for export trade, the Allied Construction Machinery Corporation being an illustration. Since then other combinations have been formed, the most recent of which is the Allied Industrial Corporation, composed of 34 manufacturers whose domestic sales are reported to aggregate $100,000,000 annually. The association reports that agents will be sent to Central and South America, Cuba, Porto Rico, the Dominican Republic, the Philippines and the Straits Settlements, not only for the sale of United States products, but for the encouragement of reciprocal trade activities here, and they state they are paying particular attention to Central and South America. The activities of the South American countries along the same line are illustrated by a number of fairs held in various countries to encourage foreign trade.

The Japanese have shown interest in the trade possibilities in South America, and recent reports state that the Japanese Mail Steamship Co. will shortly inaugurate a regular schedule of sailings touching at Rio de Janeiro, Santos and Buenos Aires. Recent reports also state that the Japanese have opened branch banks there and in other ways are promoting trade with their country.

American Bankers Seize Opportunity

That American bankers realize the opportunity is indicated by the map of South America, on which 23 branch banks are shown on the continent and seven in the immediately adjacent Central American countries. These are representative of three large banking corporations in the United States and are laying the foundation of a system which will furnish the basis for the further expansion and financing of the trade at the close of the war. In addition to the regular banking business, the war is making it possible for commercial paper to be transmitted directly to the United States without going through the hands of London houses, thus eliminating expense, and it is said that additional accommodations and the enlarging of existing exchange arrangements for American business houses are under consideration. It is also stated that the conditions under which banks can be established successfully are today much more favorable for making a beginning than they are likely to be after the war. The Bureau of Foreign and Domestic Commerce has been at work on the South American trade problem for a number of years.

That Brazil is active in foreign trade is indicated by a recently created commercial section of the Brazilian Ministry of Foreign Affairs. It has met with the unanimous approval of the press and commercial associations of the country and is rapidly completing its plans for extensive propaganda work for Brazilian products in foreign markets. Trade opportunities in Brazil include the introduction of pipes and machinery used in sewerage systems, mining machinery, brick-making and rolling mill machinery, and motor trucks. Brick-making machinery is also required in Argentine and Uruguay. The commerce report giving the information also gives the size of the brick, the probable price at which it will be sold, and other information. The commerce reports also give complete information concerning the market for construction materials and machinery in Colombia. The saving derived from the use of motor-driven vehicles, such as trucks, lorries, vans, etc., are becoming so thoroughly realized in Trinidad that the demand is already heavy, and will increase when shipping conditions become better after the war. Lack of railway facilities and the bulky nature of a large portion of the material hauled has created this demand.

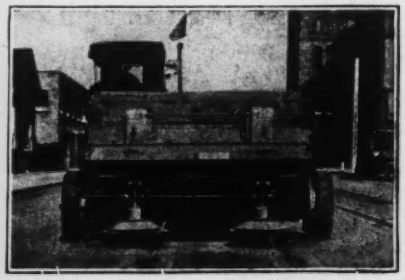
The Bureau of Foreign and Domestic Commerce states that its consular agents hold themselves ready to render all assistance possible to American firms desiring to establish trade relations of any kind, and urges that advantage of the opportunities be taken immediately.

Industrial Machinery Admitted Duty Free to Mexico

A decree excepting all mining and industrial machinery from import duty has recently been published by the Mexican government, according to data received from the American consul general at Mexico City. The decree took effect Sept. 1. Such machinery was formerly dutiable at 0.02 peso per kilo, or 45c. per 100 pounds.

Sanding Device on Street Sweeper Reduces Idleness

By the use of a sanding device attached to a street-sweeping machine, converting it into a street sander, the



STREET SANDING DEVICE

machine is put to use at times when it would otherwise stand idle. The improvement was developed by Peter J. Owen, superintendent of the street cleaning department, San Francisco.

The sweeper as supplied by the factory sprays, sweeps and collects simultaneously, but is not in such use in the foggy and stormy seasons as it is in summer, so that Mr. Owen's improvement, converting the equipment into a street sander, enlarges its use. The attachment consists of a pair of twin spreaders geared to be run at two speeds. This can be attached to the machine in place on the trap door at the front or the back. The change from sweeping machine to sanding machine and vice versa takes less than an hour. The sweeper is an Elgin motor street-sweeping machine.

War Work Shutting Off Road Construction in Northwest

Government disapproval of extensive expenditures for road work has induced a number of counties in the Northwest to issue orders suspending all highway improvement, except where it is imperatively needed to keep the roads passable. Douglas County, Oregon, has suspended all highway work, and of the $85,000 left in the treasury for road work has voted to invest $50,000 in the Fourth Liberty Loan bonds. Work on the Scenic Highway in Snohomish and Chelan Counties has been stopped. This contract totalled $50,000. Road and street work in Yakima County amounting to more than $300,000 will be discontinued.

Business Notes

The Continental Pipe & Mfg. Co., Portland, Seattle and Tacoma, has received further orders from the Government for 230,000 feet of machine-banded wood-stave pipe, varying in size from 6 to 8 in. in diameter. The order will require more than 1,000,000 pounds of wire and 500,000 feet of lumber. The three large plants of the company have previously furnished pipe, on Government orders, amounting to more than 625 carloads.

The Jeffrey Mfg. Co., makers of coal-mining machinery, electric locomotives, etc., announce that they have reopened their Cleveland branch office at 437 Leader-News Bldg. The office will be in charge of P. C. Dierdorff and C. B. Reed.

The United States Spruce Corporation, Vancouver, Wash., has been organized for the purpose of handling the spruce airplane stock production in the Northwest. It is headed by Col. Brice P. Disque, commander of the spruce division. The corporation has a capital stock of $10,000,000 and the incorporators are John Morley, Prescott W. Cookingham and John P. Murphy Colonial Disque heads the board of directors. The company is empowered to engage in a general logging business and operate mills and railroads.